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# Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON
Volume 28, No. 1 • January / February 2004

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## TRUE BELIEVERS

## ANTI-VACCINATION HYSTERIA

Caricatures of B.F. SKINNER

Oxygen Therapy HOT AIR?

The Real Method of SCIENTIFIC DISCOVERY

Searching for WILLIAM JAMES'S WHITE CROW

Why Skeptics Dread Talking with BELIEVERS

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## EDITOR'S NOTE

# *Science Always Trumps Pseudoscience—and a Still Broader Mission for SI*

I write on deadline just after the CSICOP Conference "Hoaxes, Myths, and Manias" in Albuquerque. Like the others before it, it was well-attended, lively, and invigorating—even inspiring. We'll have a report or two about the presentations in our next issue. But the conference talks, our Executive Council meeting, a new generation of young speakers at the development luncheon, social interactions—and the fact that we're starting in on a new year, 2004—stimulated a few thoughts of my own I want to share.

One, skeptical inquiry is darned fun. Speaker after speaker clearly revealed that they enjoy what they do—investigating/evaluating bizarre claims, revealing how the claims don't meet criteria for good evidence, showing what good science has to offer as an alternative.

Two, a new generation of skeptical inquirers is in place. More about this in our coming reports, but previous concerns that no one is stepping up to succeed those who founded the modern skeptical movement more than a quarter century ago are unwarranted. At universities, on new Web sites, and throughout our own expanding Center for Inquiry/CSICOP staff and proliferating CFI centers, fine young investigators and articulate spokesmen for science and skepticism are on the job. That's refreshing to see.

Third, I think CSICOP and the SKEPTICAL INQUIRER can take some credit for what some see as possibly a diminishing popular interest in things "paranormal." There's evidence that classic paranormal topics don't excite the same uncritical popular appeal they once did, and that may well be due in part to the efforts of those who have worked so hard over the past three decades to reveal the foolishness and fallacies. That doesn't mean popular interest has gone away. It is hasn't and it never will. But some of the older topics are now passé, and language, terms, and topics shift and adapt. We'll shift and adapt with them, and stay on top in the investigative/evaluative wars.

Fourth, there is no longer cause for any profound sense of isolation on the part of science-minded skeptical inquirers and people who don't share society's various religious enthusiasms. The skeptical and humanist movements have proliferated, spread, even merged some to share resources, groups, and publications (did you know CFI–International in Amherst, New York, where CSICOP is headquartered, now publishes seventeen periodicals?). New regional centers, new skeptical Web sites are everywhere.

And that brings me to my fifth point, related to the one above, but even more general. If we ever get into a funk about society's inability to distinguish good science from pseudoscience, because we deal with the latter down here in the trenches all the time, we need to realize that good science is an overwhelming force of its own, (mostly) unaffected by popular nonsense, and it is everywhere.

In addition to everything *we* do in scientific skepticism—

Every issue of *Science*, *Nature*, *Scientific American*, *Science News*, *New Scientist*, *Discover*, and *Science et Vie* is a repudiation of pseudoscience.

Every PBS Nova television show and countless others on the Discovery channel and elsewhere are repudiations of pseudoscience.

Every hallway discussion where scientists and engineers exchange ideas for the meaning of their latest data, how to assess its validity or understand

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# European Skeptics Congress: With Alt-Med's Rising Popularity, Health Issues High on Agenda

WENDY M. GROSSMAN

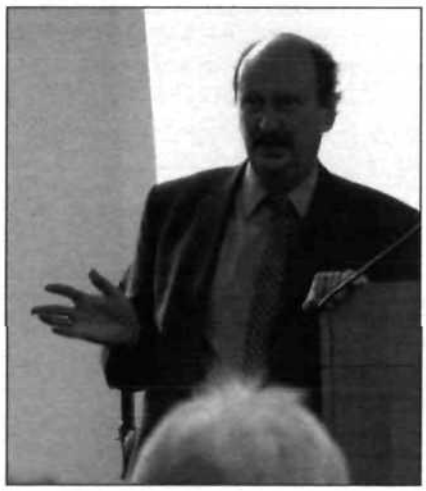
Skeptics worldwide have many common issues: the increasing acceptance of so-called "alternative" medicine (often called alt-med in Europe), the popularity of pseudoscientific beliefs like astrology and life after death, and the lack of public understanding of science. But each country's skeptics also have issues peculiar to that country. Germany has its Earth Rays, the U.S. has Therapeutic Touch, and the United Kingdom has its seemingly never-ending affair with spiritualism. At the September 2003 European Skeptics Congress, in London, these national variations were much on display, with speakers from all over Europe and the United States.

In 1985, when the last London CSICOP conference took place, it was still possible for the British skeptics to regard America with some superiority in these matters. Alien abductions, for example, was a mad belief Britons were far too sophisticated to embrace. Or creationism: clearly one of those backward American obsessions borne of our country's religious exuberance. Americans, the argument goes, are gullible and credulous, embracing any new fad that comes along—sort of the way U.S. Northeasterners think of Californians.

In 2003, though, alien abductees appeared regularly on British daytime talk shows, and creationism is on the rise. Just as in America, corporate funding is playing a greater part in academic research, and the level of science education among the general public is dropping. Where the U.S. may be concerned with the millions who have no health insurance, in Europe access to alt-med is often portrayed as a matter of consumer choice and egalitarianism. Why should only the rich and famous be able to afford homeopathy? Few public figures in Europe are as vigorous in opposing questionable health claims as the late British journalist John Diamond, who concluded during his four-and-a-half-year death of cancer that there was no such thing as alternative therapies. "There are only," he wrote in the British magazine *The Skeptic*, "therapies that work and therapies that don't."

It is because of these trends that more than a full day's worth of the conference was devoted to health issues.

Edzard Ernst, who kicked off the first day with a survey of alt-med research, put it only slightly differently: "In God we trust; all others must have data." Kimball C. Atwood, who spoke the next



Edzard Ernst

day, disagreed with Ernst—not about Ernst's contention that the evidence is poor quality but about the value of doing that research in the first place. Atwood believes we should be looking more closely at what he calls "prior probability." If a particular treatment violates everything we know about a scientific field, and the evidence is of poor quality that has not improved over a long period of time, then trials, he thinks, are pointless. Some of his examples, however,

Willem Betz

seemed uncomfortably dismissive. If all the positive research on a particular treatment comes from a single country, does that mean we should discount it? Atwood held that yes, we should.

One of Atwood's key criteria for alt-med (that the data should be getting better over time as we learn to produce the right conditions and if they don't there likely is no reality there) resonated with presentations by Ray Hyman and Robert Morris, each of whom surveyed decades of the heartbreak of psi in his own way. After a century of psychical research, we seem no nearer to finding proof.

The most startling presentation was Dylan Evans's discussion of the placebo effect, based on his 2003 book *The Belief Effect*. This is a phenomenon I first read about in a *New Yorker* article by the medical writer Berton Roueché when I was about thirteen. Is nothing sacred?

Panned in *Nature*, the next week *The Belief Effect* was chosen as book of the month by the Royal Society of Medicine. Surveying a lot of results from experimental studies in pain units, meta-analyses, and other projects, Evans was only able to find evidence for the placebo effect in reducing pain, nausea (sometimes), swelling, stomach ulcers,

depression (not as effective), and anxiety (some evidence). Conditions for which he believes there is no good evidence include cancer, schizophrenia, and most medical conditions. The jury is out, he said, on Parkinson's, asthma, and heart disease. The alarming bit of his research, however, was the discovery that virtually all the GPs he asked in a telephone survey said they would not be surprised to learn that the placebo effect could cure cancer. These days, it is very common

Michael Heap

for GPs in Europe to believe in or recommend alt-med, and scientific rationalism seems to be deserting many parts of the medical profession.

That is one reason Willem Betz, professor of family medicine at the University of Brussels, and a key member of the Belgian skeptics group, has relentlessly battled efforts to exempt alt-med from effectiveness and safety controls within the European Union. His presentation covered much of this effort. One important selling point for alt-med in Europe is consumer choice: alt-med is popular. Betz points out that consumer surveys bolstering this claim are easy to construct if you phrase the questions correctly. Betz himself would have to answer "yes" to a question that asked if he had ever used homeopathy; the fact that it was thirty years ago would not be registered.

Even so, it's clear that psychology does play an important role in many illnesses. Leslie Walker, professor of rehabilitation at the University of Hull, discussed clinical trials looking at the value of psychological approaches to the care and management of cancer patients. At the very least, he thinks, it's worth considering how we can prevent or at least ameliorate the anxiety and depression that many cancer patients experience. So far, relaxation and imagery show no signs of improving the clinical or pathological response to chemotherapy. However, the size of the tumor and the amount of mood disturbance at the beginning of treatment did act as predictors of the patient's response: both are bad news.

Michael Heap, the conference organizer on behalf of Britain's Association for Skeptical Enquiry (ASKE), deliberately made an effort to include some less obvious topics and more controversial points of view. Australian psychologist Dorothy Rowe, for example, talked about whether there is a physical basis for mental illness. Few seemed to agree with her conclusions or approach, just as few agreed with Tom Stafford, who argued that creationism should be taught in British schools as a way of teaching children how to evaluate and critique bad science.

Other less standard skeptical fare included several entertaining discussions of alternative history, both human and linguistic. Lee Keener, of the University of Northern British Columbia, investigated Egyptian pseudohistory as a way of testing what kind of contribution an amateur can make to science. Michael Brass analyzed the claims of Michael Cremo, author of *Forbidden Archeology*. And, probably the most fun, Mark Newbrook detailed his online encounters with linguistics nuts. One interesting facet is the Sommer Institute of Linguistics, whose mission is to translate the Bible into all human languages. Newbrook notes that these creationists are doing valuable work on analyzing languages, writing dictionaries, and even devising writing systems in some cases. The good linguistic work they do, he points out, can be put to use translating atheist or skeptical tracts into those languages.

Probably the most heartening thing about the conference, if you've been following European skepticism since the late 1980s, is that there's now so much of it. Many of the skeptical groups were founded in the late 1980s; they certainly didn't appear at the last London conference. The biggest difference about this conference, in fact, was the diverse national origins of the speakers and attendees. The first day's session, for example, had speakers from Germany, Belgium, Australia, and Britain (although, sadly, still almost no women).

Even so, as Richard Wiseman said on the final day, the problem for skeptics is that while we're trying to produce careful, replicable analysis the world is changing around us. People have little time to read and their attention must be caught instantly or they move on. The tools we have for using the Internet make it extremely easy to shut out viewpoints that we disagree with, admitting only information and viewpoints that reinforce our pre-existing beliefs. At the 1985 conference Karl Sabbagh called this the "ratchet effect," still a very good way to think about it.

Wiseman is probably an example of what skeptical organizations need to become to adapt to this new world. Instead, he said, of being reactive, showing in a shirt and tie as the necessary tag to dispute whatever the dubious claim is, we should be making our own news and finding creative ways to involve people in the fun of skepticism. Both he and Chris French, who surveyed the work his Anomalous Psychology unit is doing at Goldsmith's College, are making significant contributions along these lines. If skepticism is to be seen as more than a negative attitude, we need to make it the star of the show.

*Wendy M. Grossman is a freelance journalist and founder of* The Skeptic *(UK) magazine. Her Web site is at www.pelicancrossing.net. E-mail at wendyg@pelicancrossing.net.*

## Astrologers See Stars: Predictable Outrage in Astrology Land

The special June/July 2003 issue of the prestigious *Journal of Consciousness Studies* contained twelve articles devoted to parapsychology. The issue received praise for its balanced approach from *New Scientist* (September 13, "authoritative and accessible"), and from Amazon ("serious and responsible"). But what caught media attention was our own long article of twenty-four pages and eighty-five references titled "Is Astrology Relevant to Consciousness and Psi?," which one astrology Web site later referred to as "Dean and Kelly rehashing old and flawed research hype." It led to the biggest media frenzy on astrology for 2003.

We had quoted various astrologers on how a successful birth chart reading requires some kind of psychic ability, where the chart acts like a crystal ball. If this were found to be true it might require a reassessment of present theories of consciousness. But our large-scale test of 2,101 persons born on average less than five minutes apart found no hint of the similarities in personality or behavior predicted by astrology. So if astrologers (as opposed to astrology) can predict personality or behavior better than chance, as they claim to do, it might be evidence for psi.

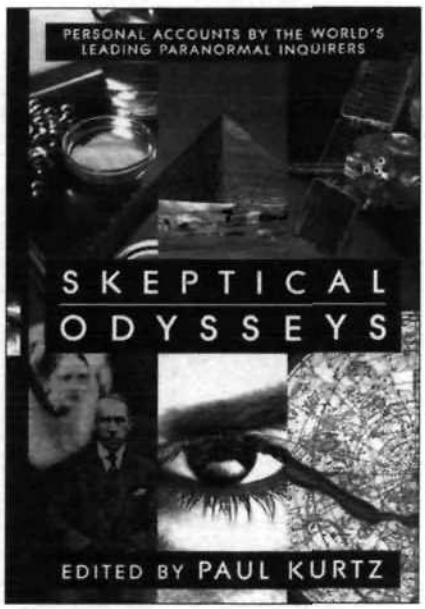
But our meta-analysis of more than forty controlled studies found no evidence that astrologers perform even marginally better than chance. They did not even usefully agree on what the birth chart indicates. More to the point, astrologers who claimed to use psychic ability performed no better than those who did not. We cautiously concluded, "the possibility that astrology might be relevant to consciousness and psi is not denied, but such influences, if they exist in astrology, would seem to be very weak or very rare."

Normally this cautious non-link between astrology and psi might have passed unnoticed. But it was picked up and distorted by the *Sunday Telegraph* London, August 17 ("Astrologers fail to predict proof they are wrong"), and was duly copied or quoted around the world from Brazil to Finland. It was distorted because our focus was psi and consciousness, not the merits of astrology (for example it provides low-priced ego support, and astrologers are generally nice people), merits we had already covered in other articles such as our chapter in Paul Kurtz's *Skeptical Odysseys*, Prometheus 2001. The result was a frenzy of misleading headlines and reports such as "Is astrology bunk?" (*Daily Mail* London, August 18), "Research paper rubbishes astrology" (*Hindustan Times* India, August 17), and "Who will put their faith in the stars?" (*Sunday Herald Sun* Melbourne, September 14).

Regardless of the distortion, astrologers were predictably outraged and uninformed. They declared that negative results are by definition due to ignorance or hostility. Indian astrologers were especially upset, commenting that "It is only a study by some crazy whites." Another said, "Most probably these two guys are unemployed." Yet another: "If you really want to test astrology . . . the only place where the research can be justified is here in India."

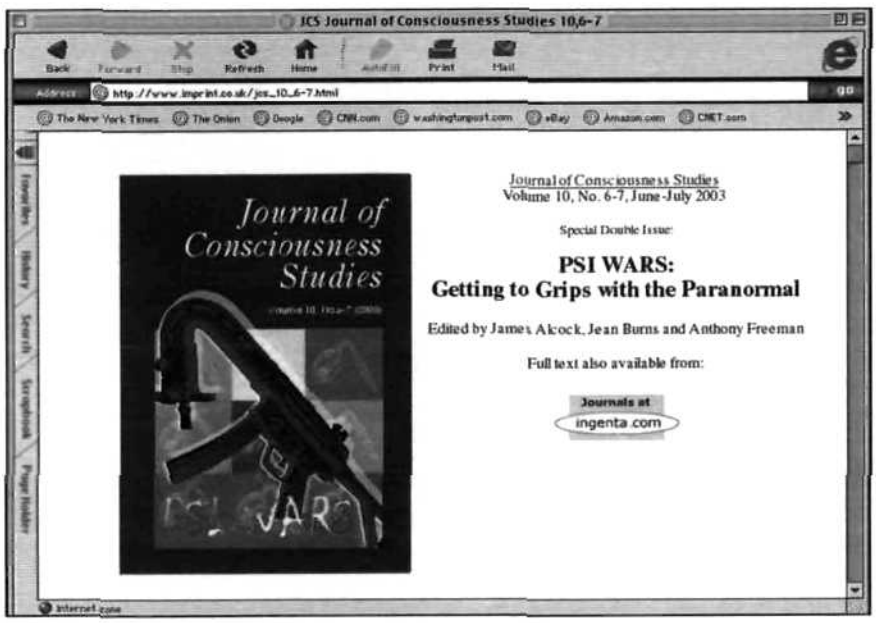
Perhaps the most notable response from India was "Astrology is Science, not Rubbish" (*India Express* August 25), where Dr. Raj Baldev "who is considered an authority on the subject of Astronomy, Astrology, Cosmo-Mathematics and Metaphysics" (he has a Web site www.occultastrology.com offering "The perfect gift. Occult Horoscope by post. Only $6.95") said we had made "an abominable mistake that can never be pardoned." He explained that ancient Hindu astrology "is a complete science" where even one million billionth of a second "makes a lot of difference." So it is ridiculous to believe that people born a few minutes apart should be similar. (Measuring birth times to a million billionth of a second implies that the position of shadows cast on ancient sundials was routinely read to better than a hundred millionth of the diameter of an atom. Even at night. Should we believe it?)

Western astrologers did not hesitate to give opinions without having read our article. In a Melbourne radio interview, Brian Clarke from the Australian




Federation of Astrologers explained how there was more to astrology than sun signs, so all was well (in fact our article had nothing to do with sun signs). In *The Guardian* London, August 19, astrologer Neil Spencer noted how astrology can "send arch-rationalists into fits of self-righteous indignation" (like his?), how our article lacks details (not true), how it ignores the positive results of Vernon Clark and Gauquelin (not true), and how the "Magi Society . . . still has to receive a riposte to its statistical challenges" (one is in SI, March/April 1997). He ends with "Astrology is not a science but a symbolic, allusive language," as if that somehow excused its failure to deliver on testable claims, to which the sociology Web site www.butterfliesandwheels.com replied, "Oh that old ploy."

The most orchestrated response came from the U.K. Astrological Association, which in 2000 had refused to publicly declare its position on sun signs despite overwhelming evidence for their invalidity (see "Sun Sign Columns," SI, September/October 2000). The AA president Roy Gillett accused Dean of seeking to "discredit astrology." The AA Web site www.astrologer.com/aanet accused us of having a "tortured imagination" and "dangerously unreliable" (not these ones), "most scientists hate astrology" (most have better things to do), the tests covered ages only up to twenty-three (so Cainer rejects phoneline callers under twenty-three?). His most notable statement was "Once again, it turns out to be an experiment rigged to make astrology look silly" (in fact it was the AA who proposed the experiment in the first place). He ends with "And some scientists claim to have a truly open mind."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Journal of Consciousness Studies
Volume 10, No. 6-7, June-July 2003
Special Double Issue:
PSI WARS:
Getting to Grips with the Paranormal
Edited by James Alcock, Jean Burns and Anthony Freeman
Full text also available from:
Journals at
ingenta.com

The second report was by "leading author and academic Frank McGillion," a consultant to the astrological research group at Southampton University, who is said to find our article "essentially flawed and well below expected academic standards." McGillion begins by saying our article is too long, then it is too short. He quibbles about definitions without providing his own definitions, he dwells on side issues without explaining their relevance, he cites unspecified "evidence" without supporting references or arguments, and he generally declines to act the way he tells Dean and Kelly to act. He says a focus on consciousness and psi "might seem less relevant . . . than the authors appear to consider" (the call for papers required it), he dislikes "the citation of names of non-scientists in formal scientific papers," and he says editing such psi papers "is a demanding task for the non-specialist" (one editor was expert James Alcock). Conspicuously absent is a description of what we did and a critique of our results.

Claims of credibility are clearly not helped when the AA (which calls itself "one of Europe's leading astrological organizations") can see these two reports as "a balanced response" and "even-handed debate." But other astrology Web sites uncritically recycled the reports almost verbatim. For example www.astrology.co.uk said we were "manipulating results . . . using self-fulfilling personality tests . . . selecting data to fit results," and committed new gaffes such as implying the average birth interval was one day (it was less than five minutes), and asking "who says astrologers are psychic?" (answer: the astrologers and surveys we quoted). Another Web site said we "are known to be opponents of astrology," as if seeking evidence was an act of heresy.

Without exception the astrologer responses boiled down to name-calling, getting it wrong, and never citing compelling evidence to support their claims. Even serious media outlets adopted this distortion. For example in the New Zealand *Listener* (October 4), in an article subtitled "a recent study claims to debunk astrology once and for all," astrologers and skeptics are seen as being permanently locked in "trench wars" and "long feuds," serious studies are seen as attacks on astrology, researchers are seen as debunkers, and astrologer quotes such as "you will never get a correlation that is significant, because we are dealing with individuals" are seen as an adequate response to failure in our meta-analysis, which the writer neglects to mention involved individuals. It often boiled down to the common refrain, "In the end, you either believe or you don't." In the end readers received only titillation for the hard of thinking. Such outlets never notice that the two sides might be talking about different things (facts versus benefits) that are not mutually

exclusive. It seems that media interest in astrology generally destroys any hope of informed debate.

For informed debate and an abstract of our article, see the user-friendly Web site www.astrology-and-science.com/. For details of the special journal issue (also available in book form, see New Books, this issue, page 58) see www.imprint.co.uk/.

*—Geoffrey Dean and Ivan W. Kelly*

*Geoffrey Dean is a technical editor in Perth, Western Australia, and a CSICOP Fellow. Ivan W. Kelly is Professor of Educational Psychology at the University of Saskatchewan and chairman of CSICOP's astrology subcommittee. Several of their articles on astrology have appeared in SI.*

## Insoles and Heel Pain: Magnets not a Benefit, *JAMA* Study Shows

Do magnetic insoles help relieve plantar heel pain better than regular insoles? The idea is part of the reinvigorated New Age fad to attribute healing powers to magnets. As with many alternative medical claims, there are anecdotal reports of success, but rigorous scientific evidence is lacking.

Now doctors from the Mayo Clinic in Rochester, Minnesota, have carried out a controlled experiment to test the idea, and, as they expected, they found no difference. Their report was published in the September 22 *Journal of the American Medical Association* (*JAMA*, 2003; 290:1474–1478).

The researchers carried out a randomized, double-blind, placebo-controlled trial from February to November 2001 of a volunteer sample of 101 adults with diagnoses of plantar heel pain. The goal was to determine whether magnetic insoles might provide greater subjective improvement for treatment of the heel pain compared with identical nonmagnetized insoles.

Magnetic insoles

The study participants wore cushioned insoles, with either active bipolar magnets or sham magnets, for eight weeks. They kept daily pain diaries, reporting average foot pain by a metered visual analog scale and by change from a baseline. The impact of the insoles on their employment performance and enjoyment was also recorded.

No significant between-group differences were found on any outcome variables studied when comparing active versus sham magnets. Both the nonmagnetic and magnetic groups reported significant improvements in morning foot pain intensity.

The researchers conclude that "static bipolar magnets embedded in cushioned shoe insoles do not provide additional benefit for subjective plantar heel pain reduction when compared with nonmagnetic insoles."

The researchers were Mayo clinic physicians Mark Winemiller and Edward Laskowski; Robert Billow, an orthopedic surgeon in Mt. Vernon, Washington; and W. Scott Harmsen of the Mayo Clinic.

*—Kendrick Frazier*

*Kendrick Frazier is Editor of the* SKEPTICAL INQUIRER

## Studies Clear Childhood Vaccine of Links to SIDS, Autism

A study released in March 2003 confirmed that there is no evidence of a link between Sudden Infant Death Syndrome (SIDS) and multiple vaccines given in infancy. Many parents have been reluctant to give their children the most common vaccine against measles, mumps, and rubella (MMR). Most American children get several vaccines during their first year of life, including MMR; some of the first questions about vaccine safety came from an Australian researcher in the 1980s who argued that MMR may cause autism. (For more on vaccination scares see "Anti-Vaccination Fever," page 21.)

Marie McCormick, head of the committee that wrote the March report, said that "although the timing of infant vaccinations coincides with the period when SIDS is most likely to occur, parents should rest assured that the number and variety of childhood vaccines do not cause SIDS."

Another study, conducted in Denmark and published in the November 2002 issue of the *New England Journal of Medicine*, is the most rigorous and authoritative to date. It examined the health records of every Danish child born between 1991 and 1998, over half a million infants. They found no difference whatsoever in the autism rates of those children who got MMR and those who did not. Dr. Kreesten Madsen, the epidemiologist who led the study, said, "If MMR made autism worse, then we would expect to see different rates in cases of both autism and related disorders."

Some researchers have suggested that a significant number of children officially categorized as victims of SIDS may in fact have been murders. An estimated five to ten percent of SIDS deaths each year are in fact infanticides. The mysterious nature of SIDS, and lack of known causes, allowed many

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mothers and fathers to kill their infants without arousing suspicion. A 1997 book on the topic, *The Death of Innocents*, uncovered several cases where this clearly occurred and pointed to many more.

SIDS deaths have declined in recent years, in part perhaps due to an information campaign encouraging parents to place babies on their backs to sleep. The program, "Back to Sleep," assumes that some infants may accidentally smother themselves if placed on their sides or face-down. Hopefully the news will put parents to rest as well, and make them less likely to reject life-saving medicines because of myths and rumors.

*—Benjamin Radford*

*Benjamin Radford is Managing Editor of the* SKEPTICAL INQUIRER

## IAU Rejects Naming Asteroid for Homeopathy Founder

*The minutes of Division III (The Solar System) of the International Astronomical Union, from IAU's triennial General Assembly in Sydney, Australia, July 14–24, 2003, contained the following short item on naming of asteroids:*

This concerns the report of the IAU Committee on Small Bodies Nomenclature (CSBN) (naming of asteroids): "One name proposed for a minor planet, in honor of a founder of 'homeopathy,' which included in its citation phrases that could be interpreted as endorsing homeopathy, had been rejected by the committee after long discussion, and the proposer asked that this decision be appealed to the entire Division. Significant discussion ensued. On the one hand, the rights of an asteroid's discoverer to name the asteroid (within the IAU guidelines) were strongly defended. On the other hand, homeopathy itself was described by several members as 'pseudo-science,' and the fear was expressed that IAU approval

*EDITOR'S NOTE Continued from page 4*

its contradictions, how to rule out certain hypotheses, how to peel away the next layer of mystery is a repudiation of pseudoscience.

The same is true of—

- Every double-blind controlled laboratory experiment.
- Every one of the hundreds of thousands of pages of scientific results published monthly in peer-reviewed journals.
- Every scientific conference throughout the world.
- Every exhibit and visit to a natural history museum, museum of science and technology, or planetarium.

Every spacecraft mission to the planets and their moons, every astronomical observation with modern instruments, every airplane flight, every medical diagnosis and procedure based on modern medicine are validations of good scientific understanding and a repudiation of pseudoscience.

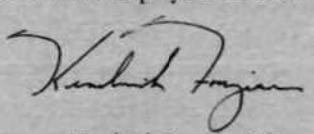
Good science is everywhere, and pseudoscience is no match for it and never will be. It may not seem that way sometimes to those of us who have chosen to fight the nonsense that seems so often to infect the public, but good science is pervasive. And, in general, most people support it, appreciate it, fund it through their taxes, benefit from its advances, and even find some occasional inspiration from television and newspaper reports of some of its discoveries.

So there is always great cause for optimism to help counter our occasional and understandable pessimistic moments. Scientific discovery is the great engine of social change, and it motivates and inspires. On the other hand, scientific advances also continually present new social challenges, often advancing quickly into new areas that overwhelm our own human abilities to cope, socially, morally, and philosophically.

CSICOP and SKEPTICAL INQUIRER plan to deal increasingly with these kinds of matters. We hope to find ways to focus on some of the wonderful new achievements of science as a counterbalance in our pages to the popularly appealing but content-free and intellectually sterile fringe-sciences and pseudosciences. At the same time we hope to deal more and more with some of the practical, social, and philosophical implications of science, as scientific discoveries open whole new troubling questions and issues that we humans have never before had to face.

All this comes under that second, more general sentence of our statement of mission that appears on the back page of every issue of the SKEPTICAL INQUIRER: CSICOP "also promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues." That's really what we're all about. In addition to continuing to be the leading forum for critical investigation of paranormal and fringe-science claims—we'll never stop being that—we will look for new ways to promote the scientific outlook and talk about some of science's incredible achievements. We want to examine more issues of broad social import that involve science and technology, not duplicating the efforts of other publications but wherever we see an opportunity for science, reason, and critical inquiry to play a useful role.

I look forward to this new, broader mission and hope you do too. It should be fun.



*Kendrick Frazier, Editor*

of this asteroid name would be seized upon by others, particularly commercial vendors of homeopathic products, as an endorsement of this technique by the IAU. Several members asked whether the citation itself could not simply be edited to remove the more controversial statements, or if the matter could be referred back to the committee (though the CSBN had already taken up the matter several times). Following this discussion, [David] Morrison moved and [Alan] Harris seconded that the Division endorse the decision of the CSBN, effectively rejecting the name. This motion passed by a vote of 25–15, and the decision of the CSBN was affirmed."

## New Resource Guide for Debunking Astronomical Pseudoscience

A new annotated guide with more than 200 skeptical resources about astrology, UFOs, moon hoaxes, faces on the planets, crop circles, and other examples of "fiction science" is now available on the education Web pages of the nonprofit Astronomical Society of the Pacific.

The guide lists and reviews articles, books, and Web sites that provide ammunition for teachers, scientists, youth leaders, television news producers, newspaper editors, and anyone who gets questions about "unsolved mysteries" relating to astronomy. Among such topics is whether the full moon causes crazy behavior, whether the entire universe could be less than 10,000 years old, and whether an alien spaceship crashed in Roswell, New Mexico.

The guide is available at www.astrosociety.org/education/resources/pseudobib.html.

The Astronomical Society of the Pacific, founded in 1889, is one of the largest and most active astronomical organizations in the world. One of its main goals is to serve as a clearinghouse for reliable educational resources and materials.

## *Newsweek* Revisits Religion and Health, Medical Prayer

The November 10, 2003, issue of *Newsweek* featured a special cover story on religion and health. The cover headline read, "God & Health: Is Religion Good Medicine? Why Science Is Starting to Believe." The story, written by *Newsweek* Personal Health Editor Claudia Kalb, was somewhat more soberly titled, "Faith and Healing." Much like the difference between the wild claims of the talker in a carnival ten-in-one show and what will actually be seen inside the tent, there is a striking difference between the cover copy designed to lure *Newsweek* readers to Kalb's article and what they will actually read once they turn to page 44.

Although the cover suggests that readers will learn that know-it-all doctors are finally coming around to recognizing that Bible study and mantra chants are as relevant to good health as the latest pharmaceuticals and surgical techniques, they will actually simply be informed that there is a significant debate about the role of religious belief and practice in medicine. Though Kalb reports on the usual inconclusive faith/health research and quotes the prime movers of the movement, she does qualify the array of often overhyped findings with an acknowledgement of the skepticism in both the medical and theological communities.

Kalb mentions research suggesting that faith can be detrimental to health. Bowling Green State University psychology professor Kenneth Pargamet, for example, found that among 600 subjects those who thought God was punishing or abandoning them were 30 percent more likely to die over the following two years. The article also briefly touches on criticisms from theologians about the very premise of quantifying God in clinical studies. She quotes Cynthia Cohen, a senior research fellow at the Kennedy Institute of Ethics at Georgetown University, who says that "[t]o think that God would only respond to the group that was prayed for and leave the other group out in the dark is based on total misconceptions of how God responds to prayer. God is not a machine who responds mechanically." Indeed, the assumption that a deity would act by delivering slight statistical advantages to certain groups completely contradicts the core tenets of theism and the belief that people can have meaningful, personal relationships with their god. This implication is seldom discussed in the superficial reportage surrounding many recent "breakthrough" studies on healing prayer proffered as evidence that medical science must accommodate religion.

Unfortunately, the overwhelming thrust of the article is that there is a "raging" debate about medicine and religion fueled by compelling new evidence of prayer's efficacy. The article is dotted with photos and sidebars captioned with lines like "The Strength of the Evidence" and "Meditating to Better Health," and laced with statistics proclaiming the public's reliance on prayer. This argument doesn't seem to square with the real debates about American health care such as access to affordable prescription drugs, the right of doctors to place the patient's interest over the HMOs profit margin, and the rapidly rising costs of health plans to businesses and employees. When more than 40 million Americans have no health insurance, whether doctors are praying with their patients hardly seems like an important—let alone raging—debate. Believers in paranormal and pseudoscientific claims often rely on their beliefs as diversion from the harsh realities of life. It is troubling to see the media lead their audiences down this blissfully ignorant path time and again.

*—Kevin Christopher*

*Kevin Christopher is Director of Public Relations for the Committee for the Scientific Investigation of Claims of the Paranormal.* □

# UFOs Over Buffalo!

Flying saucers buzzing Buffalo? The "rock jocks" from Buffalo radio station WEDG's popular morning show, "Shredd & Ragan," challenged us in July 2003 to try to explain several UFOs that a listener had caught on video. We accepted.

## The Evidence

I confess I was not eager to accept this pig-in-a-poke deal, being already hopelessly overextended and always leery of frivolous claims. (One can spend a huge amount of time endeavoring to explain some anomaly that, after all, is simply of interest to one puzzled person—or even an attention-seeking hoaxer.)

However, communications director Kevin Christopher twisted my overworked arm, noting that the case was destined to garner attention, that being local it was more accessible to investigation, and that he was sure other staffers—including three summer interns—would be glad to provide yeoman's service. Kevin prevailed and I would later tell him (quoting a famous letter from President Abraham Lincoln to General Ulysses S. Grant), "You were right, and I was wrong."

I posed one requirement, however: receipt of an affidavit from the eyewitness detailing the conditions under which his video was made and attesting that it was unaltered. This was immediately forthcoming (Szeglowski 2003), and, with greetings from his partner, Ted Shredd, Tom Ragan personally delivered a copy of the videotape to us.[1]

Viewing the video, besides Kevin and me, were experienced videographer and editor Tom Flynn, *Skeptical Inquirer* managing editor Benjamin Radford, assistant communications director John Gaeddert (who chronicled our project's activities), and interns Dawn Peterson, Benjamin Hyink, and Chris Lauer.

The video—which was made near downtown Buffalo about 6:50 P.M. on Sunday, July 13, 2003—depicted several "bright lights in the Eastern sky," as the amateur videographer himself termed the UFOs. "After observing these lights with my girlfriend and child for several moments," he stated, "I then grabbed my video camera"—a handheld Canon 8mm model—"and began to film these lights." As is indicated on the videotape (see figure 1), he then quickly obtained a tripod to steady the camera (Szeglowski 2003).

**"After observing these lights with my girlfriend and child for several moments, I then grabbed my video camera and began to film these lights."**

## Investigation

Two unusual effects on the video—the lights blinking simultaneously and the whole picture going dark at one point—were readily explained by our video expert Tom Flynn: The blinking was an effect of the "searching" function of the auto focus when images were especially poor in detail, while the image darkening was almost certainly caused by the inadvertent pushing of the fade-out button. These effects were not actually observed in the sky, but rather viewed through the camera—both by the eyewitness and his girlfriend, using the camcorder's flip-out LCD screen. Tom Flynn called our attention to the moment when the screen was unfolded from the camcorder body.

But what were the "lights," the UFOs, themselves? We could see that, in relation to the power lines, they were slowly moving and so were not stars or planets. Given the position of the sun, behind the camera, we thought it likely

*Joe Nickell is CSICOP's Senior Research Fellow and a co-editor of* The UFO Invasion *(1997).*

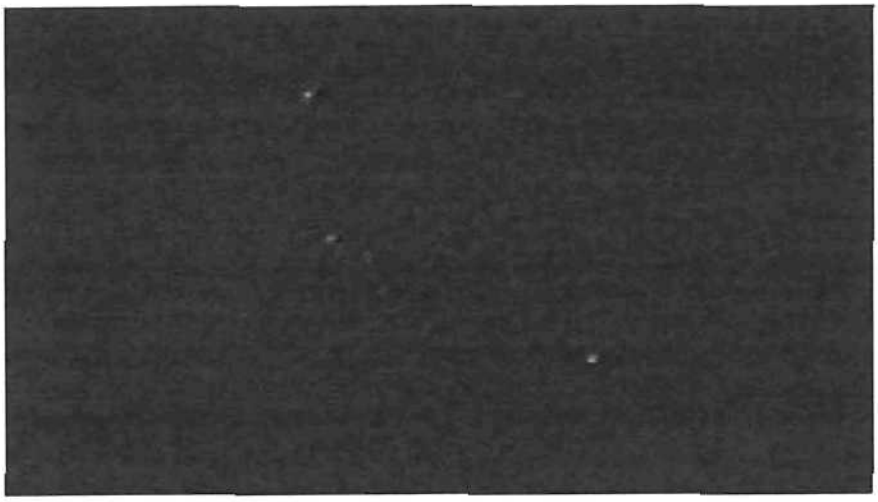


Figure 1. UFOs near downtown Buffalo, New York, were caught on amateur video. Local radio hosts challenged CSICOP to investigate.

Figure 2. "Special Agent Dawn" (Intern Dawn Peterson) prepares to release balloons as part of an experiment to replicate the UFO video. (Also shown are Paul Kurtz, Joe Nickell, John Gaeddert, and Ben Radford.)

Figure 3. Balloons replicated the appearance of UFOs in the questioned video.

the objects were not *transmitting* light but simply *reflecting* sunlight. After eliminating such possibilities as birds, gliders, helicopters, satellites, and other aerial phenomena, we settled on two basic hypotheses. Some thought the shining objects could be distant airplanes, while I brought up the possibility of balloons.

Ben Radford soon circulated a memo citing evidence from the video that the UFOs were apparently drifting rather than flying. He dubbed them Unidentified Floating Objects, consistent with balloons (Radford 2003). Chris Lauer, a double-major in meteorology and computer science at North Carolina State University, ruled out weather balloons, which he had had experience observing. However, he agreed that small helium-filled party balloons were a good possibility. Even those subscribing to the airplanes hypothesis agreed that conducting some simple experiments with balloons was a good idea. We performed them at approximately the same time of day and under similar conditions as the UFO sighting.

Our first set of experiments (July 25) was a failure. Our initial balloon releases were too far from the video and still cameras but when we corrected that problem we discovered that flat, shiny, mylar balloons tilted in the wind, flashing like signal mirrors, and had other problems.

However, for a second set of experiments (July 28) we used round, 16-inch white balloons (figure 2), and their similarity to the UFOs was immediately apparent. On video the results were striking (figure 3), even replicating the "blinking" effect. Everyone agreed with Tom Flynn's assessment of "98% confidence that we have identified the mechanism" responsible for the UFOs.

Seemingly corroborative evidence was provided by our team's student meteorologist, Chris Lauer (2003). He determined from posted airport records that on the day in question the winds were from the southwest at nine mph. This was consistent with the left-drifting, receding UFOs in the video which (since the camera faced east) indicated the objects were therefore drifting north-

eastwardly as expected. Also, someone noted that white, helium-filled balloons might have been released in keeping with a common local wedding custom.

### The Presentation

To see how convincing our results would be to others, we decided to play a little trick on our radio friends. Keeping details of our solution secret, Kevin Christopher invited Tom Ragan to a video showing at the Center for Inquiry, while letting our staff in on the intended deception. Tom Flynn queued up the original and experimental videos accordingly.

At the showing, while I made introductory remarks about the original UFO video, Tom Flynn played a clip from *our* video! Tom Ragan acknowledged that the segment looked as he recalled it. I then confessed the trick and we played both videos for him to judge. He agreed that ours was a convincing replication.

Before our ultimate appearance on "Shredd and Ragan," the radio duo's producer put our mystery video clip on their Internet site (wedg.com 2003) along with the original video which had already been airing. The unscientific poll showed that a greater percentage of respondents actually thought ours more convincing than the original (52.39 percent versus 49.4 percent).[2]

Subsequently, on August 25, Tom Flynn and I appeared as guests on "Shredd and Ragan." With quips and banter, we explained to Ted Shredd the approach we took, and he and Tom Ragan concluded on air that we had convincingly solved the mystery. Our group had transformed the UFOs into IFOs: Identified Floating Objects.

### Notes

1. The original 8-mm tape had been transformed onto a VHS tape.

2. After we revealed on "Shredd and Ragan" how our video was produced, the positive poll results naturally declined.

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THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL

# Predictions and Explanations

A common view of science is that a good scientific explanation of a phenomenon inextricably comes with the ability to make predictions about that very phenomenon. This thesis has actually been defended by professional philosophers, such as C.G. Hempel in his 1965 book *Aspects of Scientific Explanation*. And yet, a bit more reflection leads to the rather astounding conclusion that good explanations do not necessarily imply the ability to make predictions. Furthermore, the ability to predict doesn't mean that one has an explanation of the predicted phenomenon.

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The dispute goes to the heart of fundamental questions in both physics and biology. In fact, Elliott Sober provides an in-depth discussion of this topic in his *The Nature of Selection*, with a particular focus on the oft-made accusation (by creationists, among others) that the theory of evolution is simply a tautology (because it doesn't really "explain" or "predict" which organisms are the most fit). Needless to say, and as Sober readily shows, the accusation is groundless, but the more general question of the relationship between explanation and prediction is certainly of interest to scientists and skeptics alike.

Let's start with an example of prediction that does not imply explanation: even if you know nothing about weather forecasts (and, really, who does?), you can confidently predict that the temperature in a given area is going to be lower during the winter than during the summer (in the northern hemisphere). This is an induction (see "Thinking About Science," May/June 2003), an inference you can reasonably make simply by spending several summers and winters in the same place. But your observations are not an explanation of the phenomenon at hand, just an extrapolation from a record of facts. Indeed, a surprising number of people think that the explanation has something to do with Earth being closer to the Sun, which is not only false, but fails to account for the existence of the occurrence of the opposite pattern *at the same time* in the southern hemisphere.

Conversely, one can explain with little or no predictive ability. Sticking to the realm of weather forecasts, any meteorologist can give you a detailed explanation of what causes tornados, while at the same time being completely incapable of predicting when and where the next one will occur. Therefore, wishing as we may that science could provide us with both satisfactory explanations of the world and reliable predictions of what the world will do next, there are many cases in which the two simply don't go together.

Shall we blame the limitations of science for this sorry state of affairs? As Sober points out, sometime this is certainly true. After all, science is a human activity, and its very essence is characterized by the continuously provisional state of our knowledge. Nonetheless, it is possible to argue that often it is nature itself that doesn't cooperate, and poses

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strict limits to how tightly scientists can couple explanation and prediction.

Perhaps one of the best understood cases of natural limits to science is the class of phenomena known as chaotic. *Chaos*, in the technical sense of the term, refers to phenomena that are completely deterministic, i.e., effects strictly follow from their causes, always in the same manner if the conditions are identical. Nonetheless, repeated occurrences of chaotic phenomena diverge so rapidly from each other, even when starting from very similar initial conditions, that predictive ability decays exponentially with time. It will come as no surprise to the reader that many atmospheric phenomena seem to be chaotic in nature—which explains why you should be rather skeptical of any weather forecast that purports to tell you what's going to happen five or more days from now. We can write down the precise equations that govern at least some chaotic phenomena, which means we have a good theoretical grasp (an explanation) of why they occur. Yet, even that quintessential predictive tool, a solvable mathematical equation, is pretty much useless in these cases when it comes to prediction. The point is that one should not therefore conclude that we don't understand chaotic phenomena, or that somehow more information will allow more accurate predictions (this, incidentally, should have some practical effect on the funding for research and technology to make weather forecasts more accurate . . .).

**It is nature itself that doesn't cooperate, and poses strict limits to how tightly scientists can couple explanation and prediction.**

Given that the two are not tightly linked, should science be more concerned with explanations or with predictions? The answer depends on what one sees as the role of science itself. If scientific research is supposed to be supported by public money in order to benefit society with applications of its discoveries, it seems like predictions will likely be more useful to society than explanations. On the other hand, many—perhaps most—scientists get into the game because they love the idea of coming up with explanations of why nature behaves the way it does, practical applications being a beneficial, often unplanned, indirect consequence of their activities.

There is no need to overemphasize this dichotomy and force ourselves to choose sides: after all, often better explanations do bring better predictions. But it is important to keep the two distinct, especially when talking to creationists and other pseudoscientifically inclined people. It would be a great educational step forward if more people understood important aspects of the nature of science, like the difference between explanation and prediction.

## Further Reading

Sober, E. 1984. *The Nature of Selection: Evolutionary Theory in Philosophical Focus*, Chicago University Press.

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# What a Bloody Miracle!

*The next World Skeptics Congress will be held October 8–10, 2004, in Italy. For this reason, I will devote this and the next three columns to popular Italian mysteries. Should you come to the Congress you could also take advantage of your trip to visit these famous enigmas.*

Italy has a long tradition of "sacred relics." There are bones and skulls of famous saints, as well as some of their mummified bodies. Even personal garments that belonged to martyrs and saints are still kept and worshiped in various Italian churches. What usually strikes visitors the most, however, are some extreme relics: body parts like teeth, hair, nails, hands, feet, hearts and tongues (the most famous of which is certainly St. Antony's tongue kept in Padua); or some unlikely ones like the tears of Jesus Christ, pieces of the Cross, feathers of angels, and the tail of the donkey on which Jesus entered Jerusalem.

Of all these relics, only the blood of early saints exhibit some kind of alleged supernatural activity.

Clustered just around Naples, for example, there are some 190 blood relics (Alfano and Amitrano 1951). A small number of these samples liquefy from their usual clotted state—in a purportedly paranormal manner—on specific occasions, usually during religious ceremonies.

The Church of St. Maria in Amaseno, where the St. Lorenzo relic is kept.

When blood is drawn from a living body and poured into a container, the soluble serum protein fibrinogen forms a network of insoluble fibrin, which in turn forms a jelly-like clot. This clot can be mechanically broken down, but when this has been done once, no further change of state can reoccur. Thus, the resolidification of a blood sample would be even more surprising than its first liquefaction (Garlaschelli 1998).

The most celebrated of these miraculous relics is a vial containing a dark, unknown substance said to be the blood of St. Januarius, which has been liquefying once or twice a year since 1389 in Naples (Alfano and Amitrano 1924). St. Januarius was an early bishop of Benevento who was beheaded during the persecution of the Emperor Diocletian in A.D. 305. The relic representing his blood appeared in Naples more than ten centuries later, around 1389. Other relics of this kind, wherein the phase transition is evident and genuine, are the blood of St. Pantaleone in Ravello (Avellino) and that of St. Lorenzo (St. Lawrence) in Amaseno, whose visual properties and behavior seem very similar (Alfano and Amitrano 1951).

Some years ago three members of CICAP (the Italian Committee for the Investigation of Claims of the Paranormal), Luigi Garlaschelli, Franco Ramaccini, and Sergio Della Sala (1991; 1994) proposed in *Nature* magazine that thixotropy may furnish an explanation for the properties of the Januarian blood. Thixotropy denotes the property of certain gels to liquefy when stirred or vibrated, and to solidify again when left alone. The very act of handling the relic during the ceremony, repeatedly turning it upside down to check its state, can provide the necessary shear force to trigger its liquefaction. In support of this hypothesis we succeeded in preparing thixotropic samples closely resembling

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the Januarian relic, using materials and techniques available in the fourteenth century.

Although the Januarian relic is subjected to many mechanical stresses, the large vial containing the blood of St. Pantaleone (becoming liquefied around 27 July) is never moved, as it is locked behind a grate; and that of St. Lorenzo is gently moved only once a year, on August 10, from its niche to the altar. In these cases, then, thixotropy cannot be the explanation. Moreover, it appears that the liquefaction begins days before the feast day, and ends much later (precise day-to-day records are lacking).

## The Blood of St. Lorenzo

My good friend Luigi Garlaschelli, a chemist at the University of Pavia and one of the leading experts in the investigation of claims related to the supernatural, has had the rare opportunity of testing first-hand the liquefying blood of St. Lorenzo.

St. Lorenzo was martyred on August 10, 258 A.D., under the Roman Emperor Valerian, by being charred on a grill. His popularity as a saint was always great during the Middle Ages and continues today. The most famous of the relics of St. Lorenzo still existing is a small flask which allegedly contains his blood and which is venerated in the collegiate church of St. Maria in the small town of Amaseno (near Frosinone).

The relic is normally locked in a silver tabernacle in the right wing of the church. A few days before the saint's feast the niche is sometimes unlocked and the state of the relic inspected. On the morning of August 10, the relic is brought near the altar, put onto a baroque stand, and locked in a glass cabinet. There, the worshippers can witness any further transformation of its state. A ceremony is held, on that same day, in the presence of the bishop from Frosinone; at night the relic is locked again in its niche, and sometimes its further changes in the following days are checked by opening the safe a few times. No physical, chemical, or spectroscopical tests have ever been performed on this relic.

On August 10, 1996, Garlaschelli was officially invited to examine the small flask on the occasion of a television documentary. Garlaschelli took along with him a number of instruments: a camera, a caliper, an electronic balance, a test-tube whirler, some chemist's clamps, laboratory metal stands, thermometers, and beakers.

## Testing the Relic

The relic consists of a small glass flask, 15.3 cm high and weighing 141.8 grams (mean of three measures on an Acculab electronic balance). It has the shape of an

The relic of St. Lorenzo.

inverted cone, connected to a long, 2.5 cm diameter neck. The bottle is closed with a cork that cannot be removed, secured by red strings, red wax seals, and an old discolored bishop's label. However, the cork is clearly not airtight.

The vial contains an estimated 35 ml of a mixture of substances. On the bottom there is a lumpy, tan-colored layer, possibly containing sand or earth. A very tiny piece of darker material in this layer was traditionally interpreted by believers as being a particle of the coal on which the saint was martyred. A few observers even claim to see a piece of the saint's charred skin (Giannetta 1964). A second layer is above, normally in the solid state, also brownish, topped by a third, thin, more amorphous layer. When liquefied, the middle layer becomes clear, changing color to ruby red, and flows freely if the flask is tilted slightly. The bottom layer always remains solid and the top one sometimes becomes partly liquefied. When Garlaschelli examined the relic, the middle layer was liquid while the other two layers remained opaque and solid.

Garlaschelli whirled the ampoule for ten seconds on a Maxi Mixer test-tube mixer to check for a possible stress-induced thixotropic phase transition, but the only result was that the two uppermost layers became slightly mixed. The bottom layer remained unchanged, and a further ten seconds whirling failed to alter the fluidity of the viscous contents.

Garlaschelli then cooled down the small flask by clamping it at the neck and immersing its lower part into a water-ice bath. After a few minutes, the entire contents solidified into an opaque tan-colored mass.

Finally, Garlaschelli slowly re-warmed the water bath again to the initial room temperature by placing a hair-dryer under it, while monitoring its temperature. The contents of the flask melted again, and its color turned red, thus clearly demonstrating that the observed change is simply a temperature-related effect of a low melting-point compound.

## The Results So Far

The red substance cannot possibly be blood, since whole blood is typically opaque; even a clear haemoglobin solution would have decomposed and lost its bright red color over the centuries; and a water solution would have dried up from the imperfectly sealed flask (and would not freeze at 30°C).

Garlaschelli's conclusion was that the softening temperature and the overall look suggest that the relic consists of fats, waxes, or mixtures thereof, possibly containing an oil-soluble red dye. As a matter of fact, this relic is described in the church consecration act scroll (1177) as *reliquia de pinguedine St. Laurentii Mart* ("relic from the fat of the martyr Saint Lorenzo"). The liquefaction phenomenon was not observed until the seventeenth century, when it became dubbed "fat and blood" and finally just "blood." This fact might even raise the suspicion that the early relic was at that time substituted for the present one (possessing evident liquefying properties).

It is interesting that one of the hypotheses about the blood of St. Januarius was that the unknown substance is simply a mixture with a low melting point. Solid when stored in a somewhat cooler place, it would melt when taken to the warmer altar, near burning candles, amidst a fervent crowd. This hypothesis was first recorded as early as 1826 (Salverte 1826) and was quickly supported by numerous recipes, mostly based upon waxes, fats, or gelatins (plus suitable dyes). A practical, era-appropriate solution was suggested by Nickell and Fisher (1993). In any case, mixtures such as these have a constant melting point, whereas the blood-liquefaction ceremony can be performed at different room temperatures (such as during May, September, and December). Thus Garlaschelli's opinion that, in the case of the Januarian blood, the thixotropic hypothesis seems more plausible.

However, unlike the Januarian relic, the "blood" of St. Lorenzo is not contained in a sealed flask. A tiny drop of the substance, extracted with a syringe through the somewhat loose cork, might easily be analyzed by standard spectroscopic and chromatographic methods, determining the nature of the red dye and the identity of the low melting point mixture.

Almost any substance melting in that range would do; it is tempting, however, to think of fats or waxes. Fats, in particular, would be rather easily analyzed. The type and the relative amount of the different fatty acids obtained by hydrolysis of triglycerides (fats), in fact, are a sort of "fingerprint" often allowing the identification of the specific oil or fat. It could distinguish, for example, among sunflower, linseed, or coconut oils, tallow, etc.

The "blood" of St. Lorenzo looks very similar, for example, to the so-called "red palm oil," a vegetable fat extracted from the plants *Elaeis guineensis.* This alimentary fat contains reddish-orange carotenes, is yellowish when solid, and deep orange when liquid; this color change, and its exotic origin, might well have elicited fantasies about its miraculous properties. Its melting point (around 17°C), however, is lower than that of the unknown "blood," and its color seems to be more orange than red. Thus, unless it was mixed with other higher-melting compounds, better candidates might exist: coconut butter, tallow, etc. These fats are colorless and would call for the addition of suitable dyes.

Chemically, a preponderance of saturated fatty acids in the triglycerides leads to substantially higher melting temperatures. Saturated fats are also more resistant to oxidation, which creates rancidity. Since the relic's substance appears to have been fairly stable through the centuries, one should suppose a large amount of saturated fatty acids in it. Even more stable are waxes, which, however, generally have a higher melting point.

The first fat-soluble red dye that comes to mind, which has the appropriate red hue and was widely used during the Middle Ages, is "dragon's blood," a vegetable resin extracted from the plants *Daemonorops propinquus* (The Merck Index 1989); *Dracoena draco* (Thompson 1936; Edwards, Farwell, and Quye 1977); or *Calamus draco Willd.* (Villavecchia-Eigenmann 1977).

Clearly, these are just speculations. As stated above, the relic representing the blood of St. Pantaleone in Ravello also seems to behave in an exactly similar manner, and has the same visual properties. It would be even more interesting to obtain exact data on both of these maybe-not-so-miraculous substances.

The simplest check—one that Garlaschelli recommended to the relic's keepers—is a regular daily record of the state of the substance *versus* the temperature. Conclusive analysis, of course, should be of a chemical and instrumental nature (Edwards, Farwell, and Quye 1977).

After his initial test done for TV (which, by the way, never aired because of the mundane results obtained) Garlaschelli asked permission to perform further tests on the relic. So far the church authorities have denied further access to it.

**The "blood" of St. Lorenzo looks very similar to the so-called "red palm oil," a vegetable fat extracted from the plants *Elaeis guineensis.***

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# Anti-Vaccination Fever

## *The Shot Hurt Around the World*

*Sensationalist media, religious fanatics, and alternative medical practitioners fanned the fires created by questionable research to spawn worldwide epidemics of a disease that had almost been forgotten.*

WILLIAM JOHN HOYT, JR.

"A poignant television story of a victim of a rare reaction to a vaccine can render invisible the vast good brought about by this same vaccine."

—*John Allen Paulos*

When pertussis takes hold, the infected person makes horrid, whooping sounds as he inhales. When he gets a chance to inhale. Which isn't often during the torturous "paroxysmal phase," characterized by sudden attacks of repetitive, severe coughing. The disease's Latin name, *pertussis*, translates as "intensive cough." But whooping cough, the common name, does a far better job of describing the unique whooping sound the disease's victim makes when, finally, he gets a chance to breathe.

Neither the common nor the Latin name give any indication that the hacking cough and haunting whoop are often followed by vomiting. Nor does either name indicate that this distressing paroxysmal phase can last up to four weeks, and that this phase, in which the victim most clearly needs constant assistance, cruelly is also the phase in which this deadly disease is the most highly contagious. Since *highly* and *deadly* are relative terms, I should tell you that pertussis infections occur in 70 to 100 percent of all unimmunized household contacts that have been exposed to an infected person (CDNANZ 1997). In 1931, before immunization, pertussis was responsible for 1.3 percent of all deaths in England and Wales (Research Defence Society 1999).

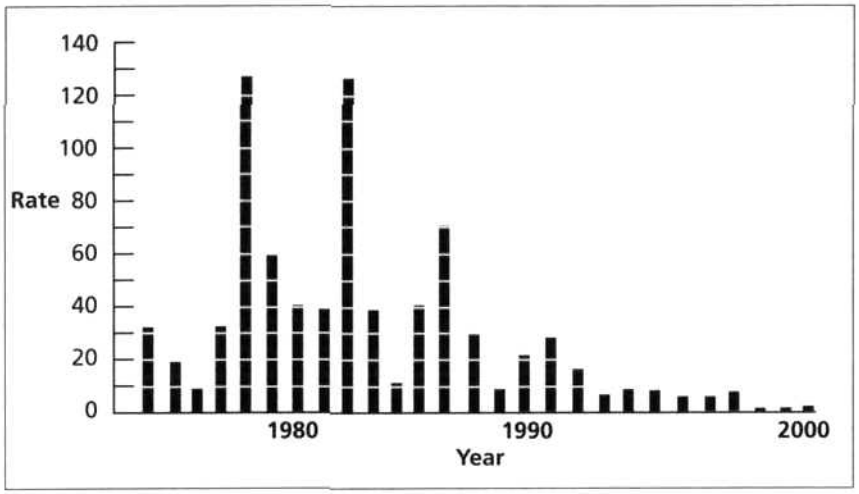


Figure 1. United Kingdom's pertussis rate (per 100,000 population).

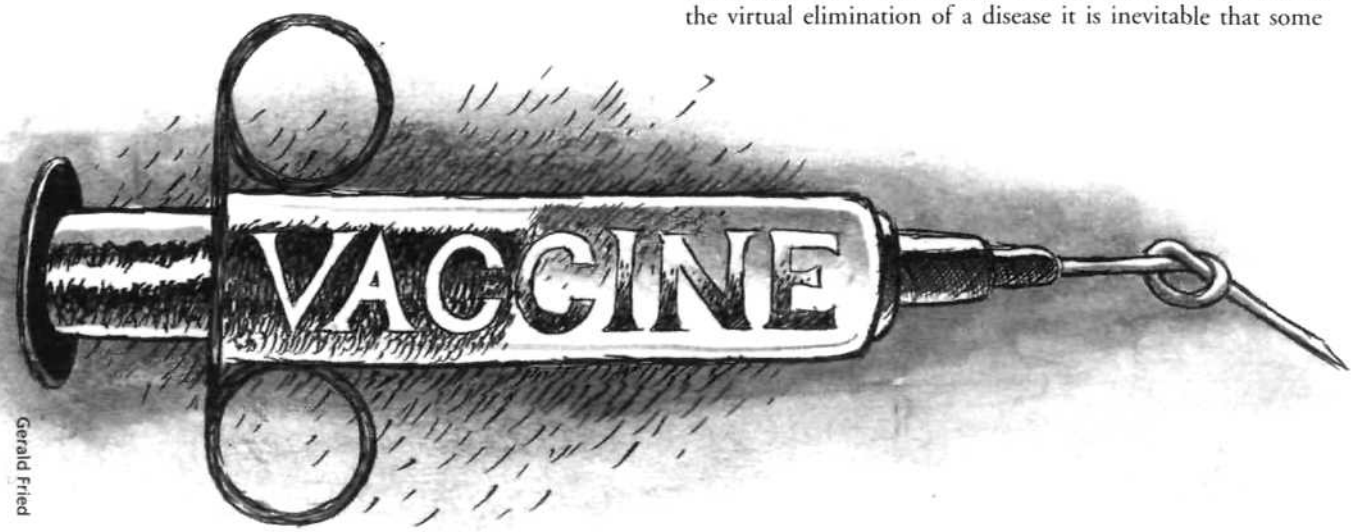
You have probably imagined an adult victim while reading thus far. In fact, before an effective vaccine became available, pertussis had been a worldwide leading cause of infant deaths. Before the 1940s, it was a major cause of infant and child morbidity and mortality in the U.S. (CDC 2002). From 1890 to 1940, in New South Wales, whooping cough killed more children under five than diphtheria. It was second only to gastroenteritis as a cause of infant deaths (Hamilton 1979). In Sydney, Australia's, Royal Alexandria Hospital for Children alone, eighty-five died in 1940: "A whole 30-bed ward was filled for months with these poor little ones. Most of those admitted were young. The older ones were not in great danger and stayed at home, going on for seemingly endless weeks with their distressing spasms of breath-robbing cough ending in a vomit or choking whoop" (Hamilton 1979).

The force of pertussis coughing is so severe that many patients develop facial suffusions (discolorations), and small hemorrhages in the skin or conjunctivae. The coughing alone can also lead to hernias, rectal prolapse (protrusion of the rectal mucous membrane or sphincter muscle through the anus), or even hypoxic encephalopathy (degenerative disease of the brain). An adult can literally cough his way into a proctologist's or neurologist's office. Vomit, food particles, or mucous aspired while whooping can result in secondary pneumonia infection. Some children even become malnourished because they literally can't stop coughing long enough to eat. And some, usually infants, die (Malleson et al. 1977; CDNANZ 1997).

## Fear and Loathing on the Vaccine Trail

In 1906, researchers discovered that the *Bordatela pertussis* bacterium caused pertussis. Within twenty years of that discovery, the first whole-cell pertussis vaccine was developed (Research Defence Society 1999). After two decades of testing and refinement, many countries accepted varying versions of a whole-cell pertussis vaccine, established vaccination protocols, and began to vaccinate their citizens. Many of the vaccine manufacturers produced a combined diphtheria-tetanus-whole cell pertussis (DTP) vaccine.

For most countries, as vaccination coverage increased, both the frequency and severity of pertussis epidemics markedly declined. Ironically, this success actually may have been the vaccine's undoing, as presaged in this pointed 1960 *British Medical Journal* commentary: "When immunization results in the virtual elimination of a disease it is inevitable that some



Gerald Fried

will question the continued need for routine inoculation of all infants" (Editors 1960).

The first hint of a problem came from Sweden in 1960, less than ten years into its vaccination program. Sweden had previously seen pertussis incidence rates as high as nearly 300 per 100,000. By 1960, the incidence rates were merely a third of that and falling (Gangarosa et al. 1998). It was at this time that Justus Ström, an influential Swedish medical leader, questioned the continuing need for pertussis vaccines. In his *British Medical Journal* paper, he claimed pertussis was no longer a serious disease because of economic, social, and general medical progress. Furthermore, he cited thirty-six cases of neurological conditions that he attributed to the whole cell pertussis vaccine, calculating an alarming neurological complication rate of 1 in 6,000 (Ström 1960).

Ström first presented his paper at a meeting of the Swedish Medical Association, where it evoked lively discussion, including some severe criticism of both his methods and conclusions (Malmgren et al. 1967). Nonetheless, Ström's twin suggestions, that the vaccine had little to do with the control of pertussis and that the vaccine may do more harm than good, shook Swedish pediatricians' faith in the vaccination program. Shortly thereafter, the Swedish Royal Medical Board appointed a special committee to investigate the matter. The committee found that Ström's adverse reaction rate calculation was off by an order of magnitude, and corrected it to 1 in 50,000 (Malmgren et al. 1967). Apparently, Ström never accepted the Royal Medical Board's corrections to his data. In 1967 he published new data claiming that neurological reactions had increased to 1 in 3,600 vaccinated children (Ström 1967). This claim further eroded confidence in the vaccine's safety. Fortunately, and perhaps owing to the Royal Medical Board's criticism of the paper, Swedish reaction was slow to take hold.

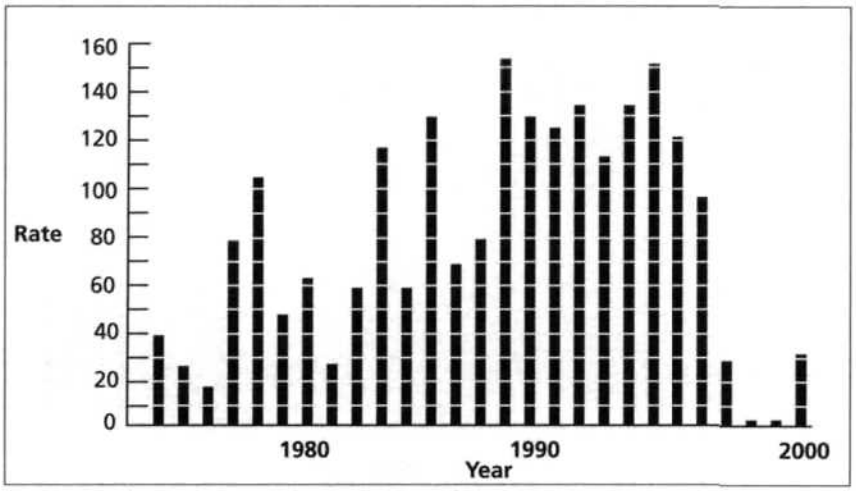


Figure 2. Sweden's pertussis rate (per 100,000 population).

Then in the United Kingdom, in 1974, Kulenkampff and his colleagues published a paper citing another thirty-six cases of neurological reactions that they attributed to the whole cell pertussis vaccine. The paper's evidence was weak on several fronts acknowledged by the authors. They clearly stated they "do not know either the prevalence of natural infection or the frequency of inoculation encephalopathy (brain diseases resulting from vaccination) in the population we serve" (Kulenkampff et al. 1974). And they noted that "in as many as a third of our patients there were contraindications to inoculation with pertussis vaccine, in that there was a previous history of fits, or family history of seizures in a first-degree relative; reaction to previous inoculation; recent intercurrent infection; or presumed neurodevelopmental defect" (Kulenkampff et al. 1974).

Despite the authors' appropriately cautious approach to their paper, the anti-vaccination advocates seized upon it, and the media ran with it. Soon after the paper's publication, British television aired a program on the whooping cough vaccine. Focusing on the anecdotal evidence of terrible adverse reactions supposedly caused by the vaccine, it presented little of the clear good the vaccine had done historically.

The negative press and television coverage persisted for years. Other doctors came forward to tell the public of the alleged horrors of whole-cell pertussis vaccination (Gangarosa et. al 1998). These included Gordon Stewart, a prominent public health academic, who claimed that the little protection pertussis vaccination afforded did not outweigh the risks (Stewart 1977). The British medical community, however, maintained a healthy skepticism. Immediately following Stewart's paper, the *Lancet* published an article concluding that "fewer immunised children were admitted [for pertussis

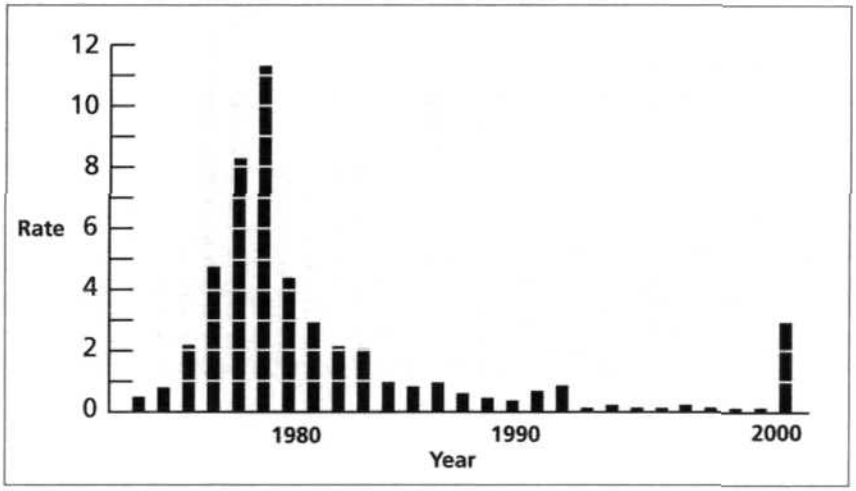


Figure 3. Japan's pertussis rate (per 100,000 population).

infection] than would be expected if immunization were ineffective" (Malleson et al. 1977). Nonetheless, vaccination rates fell precipitously. Before the brouhaha, vaccination uptake rates in the UK were about 81 percent. Between 1974 and 1978, the rates plummeted to 31 percent (Gangarosa et al. 1998; Research Defence Society 1999). The control over pertussis, which had taken the UK nearly two decades to achieve, quickly was being lost. As seen in figure 1, per capita pertussis rates rose about ten-fold during these four years (Gangarosa et al. 1998).

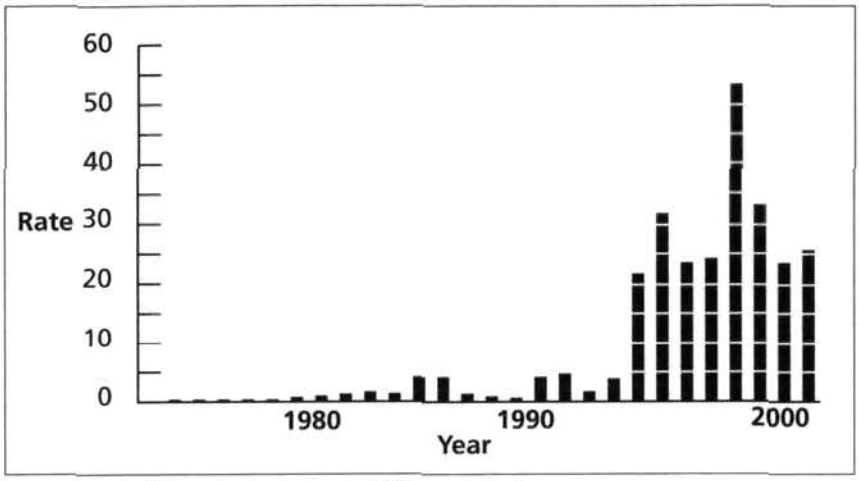


Figure 4. Australia's pertussis rate (per 100,000 population).

Meanwhile, back in Sweden, where Ström's paper had already set the stage, pertussis incidence rates had crept back up, causing Swedish physicians to further lose confidence in the vaccine's efficacy. To put this perceived problem in proper light, however, recall that Swedish pertussis rates in the 1940s and early 1950s, before the vaccine had been introduced, often hovered around 300 per 100,000. The 1975 pertussis rate (figure 2) was around 50 per 100,000 (Gangarosa et al. 1998). The backdrop had been set, though, and the physician's lack of confidence, combined with the news from the UK, prompted the Swedish medical society to abandon whole-cell pertussis vaccination in 1979. Between 1980 and 1983, pertussis among pre-schoolers skyrocketed to 3,370 per 100,000. In the years following, more than 10,000 cases per year were reported (Gangarosa et al. 1998; Cherry 1996).

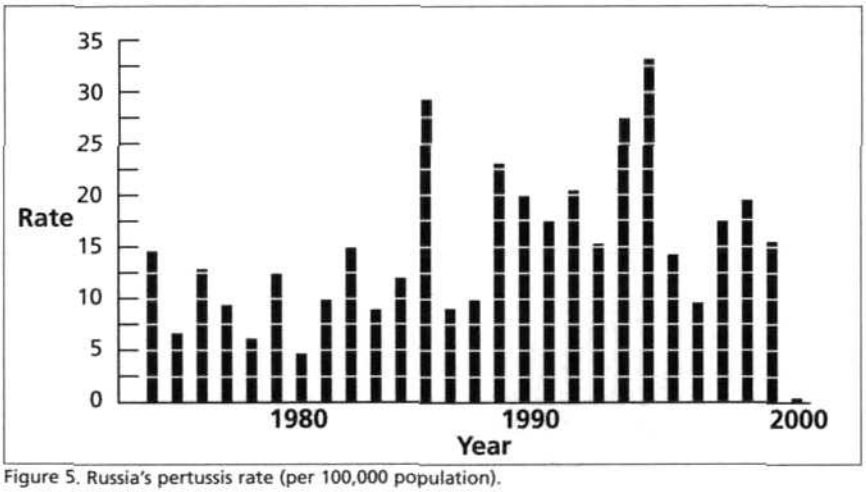


Figure 5. Russia's pertussis rate (per 100,000 population).

The Kulkenkampff paper spread quickly to Japan as well, but the Japanese response was swifter. Japan's already active anti-vaccination proponents seized upon both the UK pertussis scare and a national debate on adverse smallpox vaccination events to alarm the public. With a growing public clamor, and the unfortunate deaths of two infants within a day of vaccination, the Okayama Prefectural Medical Association eliminated pertussis vaccination altogether in 1975. Within two years, the pertussis vaccination rate for Japanese infants nose-dived from nearly 80 percent to 10 percent. Five years into this mushrooming fiasco, Japan experienced a pertussis epidemic (figure 3) with more than 13,000 cases and forty-one deaths (Gangarosa et al. 1998).

The land down under was next to react to the news of alleged neurological reactions to pertussis vaccination. The Australian public began to fear vaccine reactions more than pertussis itself, and a passive anti-vaccination movement began to grow. Australian doctors slowly stopped pertussis vaccination. A study conducted by McIntyre and Nolan in the early 1990s found over half of the Australian physicians surveyed would give diphtheria-tetanus (DT) shots when DTP was indicated (McIntyre, et al. 1994). In 1993, Lester and Nolan wrote of Australia's coming catastrophe: "[G]eographically clustered populations of children who have inadequate pertussis protection . . . could promote epidemic outbreaks" (Lester, et al. 1993).

That ink was barely dry when the first wave struck. Australia's 1994 epidemic logged more than 5,000 cases. The second wave reached Australian shores three years later. This time, nearly 10,699 cases and nine infant deaths were reported. In the 2000–2001 Australian epidemic (figure 4), by November 6, 2001, 7,185 cases and two infant deaths had been recorded (Gangarosa et al. 1998, Kingsley 2001). In this latest outbreak, the Hunter Public Health Unit in Hunter Valley, New South Wales, reported, "About 30 percent of cases in Hunter Valley have been among 10 to 19 year olds." Australian children past eight years old aren't vaccinated against pertussis "because of concerns about the possible side effects of the vaccine beyond this age" (ABC Science Online 2000).

During the 1970s and into the 1980s, the Soviet Union maintained control of pertussis through compulsory immunization. *Perestroika* changed all that. Its anti-government bias spawned an active anti-vaccination movement, one of whose targets was the pertussis vaccine. Soviet virologist Galina

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Chervonskaya inspired the Soviet media to launch a campaign to discredit vaccination, and DTP vaccination coverage rates fell by 30 percent. Not surprisingly, the Russian Federation (figure 5) also began to experience pertussis epidemics (Gangarosa et al. 1998).

## Returning to the *Status Quo Ante Botchum*

The epidemics shocked many of the nations that experienced them, although official and public responses have varied. Many countries introduced acellular pertussis vaccine as a "safer" alternative to the whole-cell vaccine. Some have also tried to control the problem by introducing more vaccination boosters to the protocol. But other countries, those whose vaccination programs were unaffected by anti-vaccination movements, haven't experienced these epidemics at all. These countries include Portugal, Hungary, Norway, the former East Germany, Poland, and, until recently, the U.S.

Japan's reaction to its epidemic was swiftest and strongest. By 1981, Japan resumed vaccination with an acellular pertussis vaccine and pertussis incidence rates returned to their pre-fiasco levels. The United Kingdom's vaccine uptake rate began slowly climbing, and by the 1990s reached levels exceeding those prior to the hysteria. English and Welsh pertussis incidence rates declined accordingly.

Sweden, however, remains plagued with high pertussis rates. As recently as 1996, and despite continuing epidemics, Sweden had yet to resume vaccinations (Cherry 1996). Australia's efforts to halt pertussis continue to be thwarted by a passive anti-vaccination movement. The 2001–2002 epidemic bears witness to that. The Russian Federation has also failed to regain control and today has one of the highest pertussis incidence rates in the developed world.

Distorted numbers, confusion of correlation with causation, and statistical innumeracy certainly played roles in this sad story. Sensationalist media campaigns fanned the glowing embers. But in each of the countries that experienced the raging fires of epidemics there were other forces at work. Most prominent in passive anti-vaccination movements were religious groups whose opposition was based on religious or moral grounds. Prominent in both passive and active anti-vaccination movements are followers and practitioners of homeopathy, chiropractic, and natural and alternative medicine (Gangarosa et al. 1998).

Despite the compelling case for vaccination that the anti-pertussis vaccination movement has inadvertently made, the Ström, Kuhlenkampff, and Stewart papers are still frequently cited in anti-vaccination literature. Speaking to *Science News*, Eugene Gangarosa, of Emory University, had this to say of anti-vaccine movements: "There's no question these movements undermine, collectively and individually, the benefits of vaccination" (Christensen 2001).

When anti-vaccination alarm takes hold—characterized by sudden attacks of the media, mistaken researchers, fervent religious groups, and alternative medicine quacks—the infected society begins to make horrid, whoppingly bad decisions. There is, as yet, no Latin name for this peculiar social disease.


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## U.S. Whooping Cough Cases Increase

**After a decade of gradually rising pertussis incidence in the U.S., sudden, alarming increases are appearing. Last year, Texas saw its reported whooping-cough cases more than double (HND 2002). This past summer, Pierce County (Washington) Health Department reported a four-fold increase in reported whooping cough cases (TPCHD 2003). U.S. immunization rates remain high, but the U.S. has followed the worldwide shift to acellular pertussis vaccines that occurred after anti-vaccination fever took hold.**

# Skepticism of Caricatures

## *B.F. Skinner Turns 100*

*Juxtaposition of recent claims about B.F. Skinner in popular science books with actual quotations from Skinner's work reveals several enduring misinterpretations. Their promulgation is unnecessary and serves no beneficial purpose for the broader scientific community.*

SCOTT T. GAYNOR

March 20 marks the 100th anniversary of B.F. Skinner's birth (March 20, 1904; he died August 18, 1990). Skinner championed psychology as a science of behavior, and in so doing, emphasized the study of behavior and the environmental events preceding and following instances of behavior. He was one of the most influential and controversial psychologists of the twentieth century. But despite his prominence, misinformation about Skinner's radical behaviorism remains widespread and is apparent in a variety of recent books. I will address three common and partially overlapping myths about Skinner, which I will refer to as the Blank Slate Myth, the Empty Organism Myth, and the Only Overt Behavior Myth.

## The Blank Slate Myth

Skinner's emphasis on environment-behavior relations has led to inferences that he believed the organism was a virtual blank slate upon which the environment writes unfettered by genetics or biology. Unbelievably, this view still exists and for many, references to Locke, Watson, and Skinner appear to be interchangeable. For example, Pinker (2002, 169) describes Skinner as "a staunch blank-slater," while a recent book on child development suggests "Skinner's view was that children were the ultimate blank tablets, passively waiting to be inscribed by reinforcement schedules" (Gopnik et al.; 1999, 19). LeDoux (2002, 83) further suggests that according to Watson and Skinner "learning was a universal capacity that worked more or less the same regardless of which animal was doing the learning and what was being learned." These authors are overgeneralizing, failing to distinguish Skinner's approach from that of Locke and Watson, the latter being infamous for making what even he admitted was the exaggerated claim that he could train any infant to any specialty. Skinner took no such position, noting that Watson

B.F. Skinner

> is probably responsible for the persistent myth of what has been called "behaviorism's counterfactual dogma." And it is a myth. No reputable student of animal behavior has ever taken the position "that the animal comes into the laboratory as a virtual *tabula rasa*, that species differences are insignificant, and that all responses are about equally conditionable to all stimuli." (Skinner, 1966/1969, 173)

If Skinner was unwilling to postulate that a laboratory animal arrives as a blank slate it strains credulity to assume he thought otherwise of humans. Skinner (1959/1972, 558) went further, lamenting that Watson is remembered "for an extreme environmentalism, and for a coldly detached theory of child care, no one of which was a necessary part of his original program." Thus, it is even more regrettable and contrary to fact when Skinner is characterized similarly.

For Skinner, behavior was clearly seen as the product of the combination of genetics and environment: "The environment made its first great contribution during the evolution of the species, but it exerts a different kind of effect during the lifetime of the individual, and the combination of the two effects is the behavior we observe at any given time" (Skinner 1974, 17).

Thus, behavior is seen as the result of both genes and environment. Genes alone do not engage in behavior. Unified, whole organisms interacting in and with an environment behave. The influence is interactive and nonreducible. This point, while apparently obvious, is especially important when dealing with a fluid subject matter like behavior (or patterns of behavior), where environmental consequences for a particular class of behavior commingle with innate repertoires, quickly making them inseparable: "It would be hard to say how much of the strength of the behavior is due to each. . . . We may have an innate repertoire of aggressive behavior, but similar behavior is generated by many contingencies of reinforcement" (Skinner 1984, 220).

## The Empty Organism Myth

A corollary of the Blank Slate Myth about Skinner is the Empty Organism Myth, which suggests that Skinner dismissed or ignored the role of the brain in learning. For example, according to Ridley (1996, 258) Skinner's "behaviorism held that animals' brains were black boxes which relied upon pure association to learn any task with equal ease." Similarly, Pinker (2002, 20) suggested that for Skinner "studying the brain was just another misguided quest to find the causes of behavior inside the organism rather than out in the world."

In Skinner's view, the contingencies of survival (i.e., evolution) give us not only a genetic heritage, but also a central nervous system that is modifiable by consequences (the first great contribution of the environment): "What evolves is an organism as a physical system, and it is such an organism that is modified by operant conditioning" (Skinner 1975, 120).

In other words, organisms have as an evolved feature a central nervous system that is capable of being altered by experience. We are born with a brain that is flexible, plastic, and incomplete. The flexible, adaptable brain can take full advantage of selection by consequences occurring during the lifetime of the organism (the second great contribution of the environment): "Just as genetic characteristics which arise as mutations are selected or discarded by their consequences, so novel forms of behavior are selected or discarded through reinforcement" (Skinner 1953, 430).

One unique aspect of humans is our protracted period of immaturity (i.e., childhood), which must have been evolutionarily selected for. Why this lengthy period of immaturity? One reasonable hypothesis is that it provides us time to learn

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about our specific environment (see also Gopnik et al., 1999): "A long infancy gives the ontogenic process greater scope, and its role in adapting to very unstable environments is a great advantage" (Skinner 1984, 220).

Thus, the development of the trillions of neural connections in the brain is shaped collaboratively by biological and environmental factors. Moreover, given a central nervous system that is modifiable by consequences, one can conclude that all variables that affect behavior inevitably also affect the neurobiological state of the organism. Moreover, changes in behavior derive from—and are correlated with—neurobiological changes. In Skinner's words:

> The physiologist of the future will tell us all that can be known about what is happening inside the behaving organism. His account will be an important advance over a behavior analysis, because the latter is necessarily "historical"—that is to say, it is confined to functional relations showing temporal gaps. Something is done today which affects the behavior of the organism tomorrow. No matter how clearly that fact can be established, a step is missing, and we must wait for the physiologist to supply it. He will be able to show how an organism is changed when exposed to contingencies of reinforcement and why the changed organism then behaves in a different way, possibly at a much later date. What he discovers cannot invalidate the laws of a science of behavior, but it will make the picture of human action more nearly complete. (Skinner 1974, 236–237)

The last sentence of the above quote may be a source of much of the confusion. While biological science is clearly seen as important and useful, a science of behavior is not dependent upon and need not wait around for biological advances. That is to say, psychology and neurology/physiology are different sciences, working at different levels of analysis. Neurological/physiological explanations are not necessary to legitimize psychological science. Neurology/physiology may provide explanations at that level of analysis, but that explanation cannot undo established environment-behavior relations at the psychological level of analysis. Moreover, when important neurological events are identified, "These events in turn will be found to be preceded by other neurological events, and these in turn by others. This series will lead us back to events outside the nervous system and, eventually, outside the organism" (Skinner 1953, 28).

This is not a rejection of biology, but rather a call for, and emphasis on, rigorous understanding of environment-behavior relationships in their own right. Indeed, "A comprehensive set of causal relations stated with the greatest possible precision is the best contribution which we, as students of behavior, can make in the co-operative venture of giving a full account of the organism as a biological system" (Skinner 1956/1972, 270).

An example might help to clarify here. It is well established that a tone that has preceded a shock comes to reliably produce a response (e.g., a lever press) that has terminated the tone and preempted the shock (escape/avoidance conditioning). Finding that damage to, or removal of, the amygdala influences this type of learning (LeDoux 2002) provides important additional information and was more readily achieved because it could build upon an already known environment-behavior relationship. Likewise, that effective psychosocial intervention for social phobia produces changes in amygdalar functioning (similar to effective pharmacotherapy, see Furmark et al., 2002) is fascinating, consistent with the view that changes in behavior are correlated with changes in neurology, and leads to a fuller account of the process of effective psychotherapy. However, it is also the case that identification of the biological changes was not required to establish the validity of the behavior changes observed: "By appealing only to environmental variables (while assuming a given set of genetic and organic variables), psychology may make this contribution entirely within its own field. That there are etiological factors lying beyond this field is doubtless true" (Skinner 1957/1972, 253).

The preceding should make clear that Skinner was not antagonistic to biology, recognized that brain changes are necessarily correlated with changes in behavior, and would concur that the most complete account involves understanding environment-gene-brain-behavior relationships. However, his level of analysis was environment-behavior relationships and these cannot be removed from the sequence. He writes, "The organism is, of course, not empty, and it cannot be adequately treated simply as a black box, but we must carefully distinguish between what is known about what is inside and what is merely inferred" (Skinner 1974, 233).

While Skinner clearly recognized the importance of genetics and biology, he was adamantly opposed to mentalism—that is, to invented, hypothetical, or metaphorical nervous systems that are in principle unobservable (i.e., nonphysical) and confuse psychology with physiology/neurology. I turn to Skinner's rejection of mentalism, but not covert events, next.

## The Only Overt Behavior Myth

Even if we accept that Skinner recognized that humans are not biologically empty, clearly it is accurate that he saw the organism as cognitively empty, right? According to Seligman (2002, 31), Skinner "argued for half a century that all of mental life was mere epiphenomena. . . ." Pinker (1997, 62) concurred that Skinner "held that beliefs and desires have nothing to do with behavior—indeed, that they are as unscientific as banshees and black magic." Not exactly. Skinner opposed mentalism but did not reject the role of private events.

> The distinction between public and private is by no means the same as that between physical and mental. That is why methodological behaviorism (which adopts the first) is very different from radical behaviorism (which lops off the latter term in the second). The result is that while the radical behaviorist may in some cases consider private events (inferentially, perhaps, but nonetheless meaningfully), the methodological operationist has maneuvered himself into a position where he cannot. (Skinner 1945/1972, 383)

Furthermore, Skinner writes that

> Mentalism kept attention away from the external antecedent events which might have explained behavior, by seeming to supply an alternative explanation. Methodological behaviorism did just the reverse: by dealing exclusively with external antecedent events it turned attention away from self-observation and self-

> knowledge. Radical behaviorism restores some kind of balance. It does not insist upon truth by agreement and can therefore consider events taking place in the private world within the skin. It does not call these events unobservable, and it does not dismiss them as subjective. (Skinner 1974, 18)

Behavior lies on a continuum: some is only privately observed (e.g., thinking, imagining), while some is publicly observed (e.g., movements), but all of it is in principle observable and hence amenable to scientific analysis. Private responses are not dismissed by Skinner (as in Watsonian, methodological, behaviorism) but are also accorded no special status and are not seen as different in kind from other behavior.

> Covert behavior is almost always acquired in overt form and no one has ever shown that the covert form achieves anything which is out of reach of the overt. . . . It [covert behavior] does not explain overt behavior: it is simply more behavior to be explained. (Skinner 1974, 115)

Consider, for example, the question "What is the tenth word of the National Anthem of the United States?" To solve this problem you might a) write out the words and then count them, b) rehearse the words silently while counting on your fingers, or c) rehearse and count silently. What happened here? In response to the external antecedent event—the problem—a sequence of overt and/or covert responses were then emitted, each of which changed the situation/environment and controlled subsequent responses that ultimately made emission of the correct response (i.e., *light*) more probable. Skinner's analysis recognizes the importance of the various overt and/or covert responses in the causal sequence but requires that the causal sequence be completed by extending it backwards to the external antecedent and forward to the consequences for correct or incorrect responses. Furthermore, note that there was no necessity that your sequence of overt and/or covert behavior led to a correct answer. Most obviously, if you lack exposure to the National Anthem of the United States (or your repertoire is deficient in basic counting skills), effective overt or covert adjustments are unlikely. The last point emphasizes again the importance of prior selection by consequences (i.e., the individual's learning history) in explaining current behavior (both overt and covert).

> Human beings attend to or disregard the world in which they live. They search for things in that world. They generalize from one thing to another. They discriminate. They respond to single features or special sets of features as "abstractions" or "concepts." They solve problems by assembling, classifying, arranging, and rearranging things. They describe things and respond to their descriptions, as well as to descriptions made by others. They analyze the contingencies of reinforcement in their world and extract plans and rules which enable them to respond appropriately without direct exposure to the contingencies. They discover and use rules for deriving new rules from old. In all this, and much more, they are simply behaving, and that is true even when they are behaving covertly. (Skinner 1974, 245–246)

This description is a far cry from considering human beings passive, empty, nonthinking black boxes.

The purpose of this article is not to recruit adherents or to convince anyone of the relative merits of Skinner's position, nor to denigrate or dismiss the theories of the contemporary authors cited. My goal was simply to use the occasion of the approaching 100th anniversary of Skinner's birth to clear away some mythical debris that remains about his approach to psychology as a science of behavior. The material presented does not constitute historical revisionism, but Skinner in his own words with some supporting text and examples. You may disagree with Skinner's actual positions, but it serves no purpose to disagree with myths or caricatures. Indeed contemporary behavior analysis does not sit still looking backwards, but continues forward from the tradition established by Skinner making important advances in a natural science approach to emotions and motivation (see Dougher and Hackbert 2000; Michael 2000), problem solving, cognition, and language (see Donahoe and Palmer 1994; Hayes, Barnes-Holmes, and Roche 2001). Skinner would have it no other way: "The study of human behavior is, of course, still in its infancy, and it would be rash to suppose that anyone can foresee the structure of a well-developed and successful science. Certainly no current formulation will seem right fifty years hence" (Skinner 1956/1972, 260).

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# Fallacies and Frustrations

## *Why Skeptics Dread Conversations with True Believers*

*Skeptics often hesitate to engage in conversations with believers in the paranormal because these conversations are usually very frustrating. Paranormal adherents tend to make fallacious use of language, logical arguments, and established knowledge. Yet skeptics must acknowledge and work past these frustrations to further the cause of rational inquiry.*

PHIL MOLE

How many times has the following situation happened to you: You're at a party or social event, distractedly sipping your beverage of choice, when suddenly the conversation turns to paranormal or pseudoscientific topics. You squirm in your chair, dreading the moment you know is coming. Hoping the topic will change, you look at your watch, drink your beverage just a little too quickly, and nervously adjust your shirt collar. Then, the moment you've been dreading finally comes. Someone asks you for your opinion.

Why should situations like this be so uncomfortable for skeptics? It isn't usually because we lack confidence in our opinions, because skeptics usually have much more knowledge

about paranormal topics and the rules of critical thinking than the general public. Rather, the cause of our anxiety is usually the awareness that the ensuing conversation is likely to be unproductive and extremely frustrating for us. We know that our acquaintances are certain to derail the discussion with countless argumentative fallacies, and our efforts to refute these fallacies are more likely to result in exasperation than in enlightenment. There are many varieties of these obstacles to rational discourse, but most of them involve misuses of language, logical blunders, or ignorance of the facts and ideas relevant to the issues.

## Fallacies of Language

Much of the frustration we skeptics encounter arises from the seeming inability of many people to correctly use and understand language. It shouldn't be this way. Most people have some schooling during their lives, and presumably learn how to distinguish the meaning of one word from another. Moreover, dictionaries can clear up any remaining confusion unaddressed by our formal education. But yet, when the crucial moment comes for people to read or listen to someone else's argument and discern its meaning, they often stumble. They seem unable to comprehend that words already have well-established definitions, and it isn't permissible to make up their own whenever convenient opportunities arise.

Consider the following example, assembled from various actual discussions in which it has been the author's misfortune to participate. Suppose you're discussing an Arts and Entertainment network program about the amazing fulfillment of biblical prophecies that claims the apocalypse will soon be upon us. Your acquaintance wonders how you can deny that so many of the Bible's "predictions," such as the

onset of atomic warfare, the AIDS epidemic, and unprecedented numbers of wartime deaths, are now coming true. You object that there are not unprecedented levels of warfare or illness epidemics in our time; in fact, other historical periods had far higher death counts. More important, you point out that the Bible never actually "predicted" any of these things, because the definition of *prediction* implies an unambiguous assertion that a specific future event will happen in a specific way. Playing games with language to link vague phrases from the Bible to specific events in our own time is not logically permissible, and runs roughshod over the conclusions of sound scholarship. Real scholars, familiar with historically informed Bible criticism published in peer-reviewed academic journals, reject the idea that biblical prophets were talking about anything remotely similar to AIDS or other twentieth-century calamities. Such a selective and uncritical reading of the Bible does not serve anyone's purpose, religious or otherwise.

**Most people do not have the critical thinking skills necessary to craft good arguments, and continually try to pass off logical fallacies as sound reasoning.**

"Maybe you're talking about the tension between academics and faith," he offers. You can't recall talking about anything remotely like this, so you reject his attempted solution. "No I wasn't," you say, "and anyway, there doesn't seem to be any necessary tension between 'academics,' as you say, and religious faith. Many academic Bible scholars of exceedingly high reputation are men of faith, and while not all of them believe in the same way that most people do, they nonetheless do believe."

"That's not what I meant," your acquaintance answers, "for now I see that instead of saying 'academics,' I should have said 'reason.' I really meant to say that we cannot disprove the tenets of faith. Bible prophecies are matters of faith, which has nothing at all to do with reason." Now you don't even know where to start. You can't help but wonder how your acquaintance initially confused the meaning of *reason* with *academics*, and wonder why he thinks that just because something isn't completely disprovable, it has nothing to do with reason. After all, it's also impossible to disprove the notion that an invisible, colorless, odorless, tasteless, noncorporeal goblin is lurking in my basement, although few sane people would find this reason enough to believe the goblin exists. Therefore you reply by saying that people generally believe things that seem at least plausible to them, even if faith also involves going beyond what we can know through reason.

Since things are going badly for his arguments, your acquaintance pushes even further into definitional dubiousness. "I see clearly where your confusion lies," he says, "because you were using an alternate definition of *reason*. I was using the word *reason* in its 'classical' sense, as a term for 'science.' In that sense, faith has nothing do with reason, because science cannot disprove the tenets of religious faith."

Once again, you find yourself perplexed by the shifting pattern of fallacious definitions on display. You can't help but wonder if your acquaintance is trying to redefine the entire debate in terms that automatically support his conclusions. You're frustrated by his repeated failure to accurately use and understand the existing definitions of words. You try to explain that *reason* is not a synonym for *science*, in its "classical" sense or any other sense, and that there is a complicated relationship between science and religion that should preclude us from making simple judgments about their interactions. In addition, *disproof* means something rather different to a scientist than it does to a layperson. But your acquaintance, gleefully unencumbered by any adherence to word definitions, still sees *reason* as being identical to *science*, and for good measure, even accuses you of shifting the definitions of the debate terms to find fault with his arguments. Through the most ironic redefinition of all, the skeptic is now the one who doesn't understand how to use words correctly, and our good-natured acquaintance can only marvel at our verbal ignorance.

## Fallacies of Logic

Assuming our opponents know the correct definitions of the relevant terms, there's still a great chance that they'll make debates frustrating for us. Most people do not have the critical thinking skills necessary to craft good arguments, and continually try to pass off logical fallacies as sound reasoning. It would require an entire book to catalogue and describe all of the logical fallacies the skeptic encounters in his travels among the credulous, but I will list a few of the most common varieties.

The *false dichotomy* presents an issue as an all-or-nothing choice between only two alternatives. When presenting an issue as a false dichotomy, a person is usually trying to simplify a complicated issue into terms he can more easily understand, and render his own opinion more plausible in the process. For instance, paranormal true believers frequently use false dichotomies in arguments about the validity of the anecdotal evidence offered to support claims of ghost sightings, alien visitations, and other Fortean phenomena.

Paranormalists often maintain that the people who claim to

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have had these experiences must be telling the truth, or they must be either lying or crazy. Since there is often no reason to think that people reporting paranormal experiences are clinically insane or documented liars, believers confidently rule out the second half of their artificial dichotomy and conclude that the paranormal claims must be true. "Why would they make this up?" they triumphantly ask. They seem unaware that there are many other possible explanations. [See John McDonald, "200% Probability and Beyond: The Compelling Nature of Extraordinary Claims in the Absence of Alternative Explanations," SKEPTICAL INQUIRER, January/February 1998.]

A witness may believe he is telling the truth, but his perception and memory of the events may be distorted by many psychological and social factors. However, full awareness of these other options requires strong knowledge about psychology, sociology, and the subtle effects of culture on what we see and remember. It's much easier to just reduce the whole issue to two choices.

The *fallacy of personal preference assumptions* is a species of argumentative fallacy that I have not seen discussed before. This fallacy conveniently assumes that people who report paranormal experiences have personality traits that guarantee the authenticity of their reports. Let me explain.

Suppose one of our friends wants to visit a hotel allegedly haunted by ghosts, according to the informative hosts of the History Channel's show "Haunted History." The television program supplies anecdotes about former guests who claim to have seen or felt ghostly visitors during their stay at the hotel. The obvious skeptical response is that the guests had foreknowledge of the ghost legends surrounding the hotel, and this knowledge caused them to imagine their spectral visitors. But hearing this explanation, our acquaintance replies that if they had known about the legends, they never would have stayed at the hotel!

Presumably, their fear of seeing a ghost would have kept them away. Therefore, no one who visited a haunted hotel could have had foreknowledge of haunting legends that may influence their observations. Thus, our paranormalist friend concludes, all observations of ghostly phenomena at the hotel must be objective and reliable. This reply blatantly ignores the obvious fact that our acquaintance herself wants to visit the hotel, and knows very well that it is allegedly haunted. In fact, that's the whole reason she wants to visit the hotel! How can she assume that the other visitors, who probably watch the same popular television shows about ghosts and have the same widespread fascination with the supernatural, would refuse to stay at a "haunted hotel?" Such an assumption claims a knowledge of the personal preference of the guests that she cannot possibly have. Clearly we cannot rule out the strong possibility that the guests may have had prior expectations that compromised their reliability as witnesses. Equally clearly, we cannot make personality preference assumptions wherever convenient opportunities arise.

This fallacy allows our acquaintance to surmise that the hotel guests have personality traits different from her own and from those of the general public, simply because this assumption makes their testimony about ghostly visitors more plausible.

The *post hoc fallacy* consists of automatically attributing the cause of a phenomenon, after the fact, to an unrelated event preceding it. This fallacy seems to be deeply ingrained in the thinking habits of our species. David Hume, in his classic *An Essay Concerning Human Understanding*, provided a psychological description of the process through which people perceive causation, and showed that events that closely precede a phenomenon in time are most likely to be seen as causes of that phenomenon. Sometimes this habit leads us to correct assumptions, but often it leads us to find causal relationships where none actually exist. The most common examples of a *post hoc* fallacy involve superstitions, such as belief in "lucky" items of clothing. For example, someone buys a new shirt and suddenly finds herself awarded with a big promotion at work. There's no logical reason to think that the shirt had anything to do with her promotion, especially since management probably made the decision long before she ever set foot inside the clothing store. But the close association of the two events in time seems strangely compelling, and she reaches the *post hoc* conclusion that her lucky shirt was the cause of her new prosperity. The skeptic who tries to argue with her is likely to be in for a frustrating time.

**A witness may believe he is telling the truth, but his perception and memory of the events may be distorted by many psychological and social factors. However, full awareness of these other options requires strong knowledge about psychology, sociology, and the subtle effects of culture on what we see and remember.**

The argument from incredulity maintains that if we cannot easily imagine the proposition is true, we are justified in concluding that it is false. This strategy uses the assumption that whatever is not instantly comprehensible must be wrong. Creationists are masters of arguments from incredulity, and use every available opportunity to portray evolution as the far-fetched pipe dream of egghead scientists. Science-fiction writer and Scientology founder L.Ron Hubbard, who was a creationist of a particularly odd sort, once described evolution as a modern

variant of an ancient Egyptian myth describing the magical appearance of the first living creatures from primordial ooze. Creationists want evolution to seem as though it argues that man sprung fully-formed from the chaos of nature like Athena from the forehead of Zeus—an idea clearly too ridiculous to believe. Of course, the use of this strategy saves its proponents the bother of actually learning something about the issues they're discussing, or acknowledging that some familiarity with the philosophy of science and the methods of critical thinking could prove beneficial to them. It also tends to skew evaluation of ideas toward arguments that seemplausible to most people, regardless of their validity. Arguments from incredulity wallow in a vulgar populism that elevates appeal to unlearned prejudice to a categorical imperative, and rejects as meaningless all attempts to achieve deeper understandings.

## Fallacies of Ignorance

If I had to pick the most common source of frustration for skeptics, I'd have to choose plain old garden-variety ignorance. Ignorance involves knowing very little, or at least not nearly enough, about the issues one is discussing. Far too often, impaired knowledge of an issue does not deter people from offering their opinions about it, and from being absolutely sure that their ideas are the very embodiment of informed rationalism. As the observant reader may have already noticed, ignorance is related to all of the frustrations and fallacies already discussed. Indeed, it is the center of the credulous person's universe. It is the foundation of every logical fallacy, the cause of every miscomprehension, and the font of all foolishness.

There are countless examples of ignorance at work. Historical ignorance is present whenever right-wing pundits claim that the United States began as a Christian nation, and whenever left-wing pundits argue that Native Americans lived in perfect harmony with nature. We see scientific ignorance when creationists claim there is no empirical evidence for evolution, and misguided consumer-rights groups try to eliminate the fluoridation of drinking water. In all these cases, the claimants do not adequately understand the issues at hand.

Ignorance does not always have to involve plain fact, such as the month Abraham Lincoln originally planned the Emancipation Proclamation or the age of the oldest known hominid fossil. Often, it takes the more general and pervasive form of simply being unaware that there is anything more to an issue than what one already knows about it. This kind of ignorance is especially prevalent among paranormalists, who often learn everything they know about a particularly poltergeist haunting or UFO abduction by watching Discovery Channel programs, and aren't aware of the strong counterarguments and other parts of the story withheld from them. Few of the countless television specials about the Amityville "hauntings" mention the inconvenient fact that the originators of the stories admitted to perpetrating a hoax, or that the mysteries of the Bermuda Triangle were definitively explained more than two decades ago. The public often fails to realize that programs such as those found on the Discovery Channel have a well-documented policy of denying airtime to anyone skeptical of paranormal claims.

Thomas Aquinas noted that ignorance is often consolatory, especially if it involves issues that we've already interpreted to our own liking. Finding further information about issues may dispel our ignorance of them, but may also threaten our happiness and self-esteem. Stories of ghosts are not only entertaining, but also allegedly provide comforting proof of life beyond death. Alien visitation stories suggest that we are not alone in the universe, and we may one day meet extraterrestrials. The alternate notions that ghosts do not exist and we have a greater chance of getting struck on the head by a meteor than we do of encountering intelligent alien life are somewhat disheartening. It's not surprising that most people don't want to expend effort to dispel their ignorance, if ignorance provides comfort.

## Conclusions: Coping With Frustration

The net result of these frustrations is that we skeptics often feel wary of even attempting to engage in conversations with believers of dubious claims. We know we are very likely to encounter several fallacies discussed here in the course of a single discussion.

Each attempt to refute a fallacy causes our credulous acquaintance to commit about three new ones, which then require debunking of their own. And so it goes, until you're about twenty minutes into the conversation and realize you've gotten precisely nowhere. Our partners in conversation are too frequently unwilling or unable to critically examine their own assumptions, or think critically before offering their opinions. As a result, we find ourselves in the conversational equivalent of running on a treadmill. We can begin to understand what Leo Tolstoy meant when he said, "Freethinkers are those who are willing to use their minds without prejudice and without fearing to understand things that clash with their own customs, privileges, or beliefs. This state of mind is not common, but it is essential for right thinking; where it is absent, discussion is apt to become worse than useless."

Accepting Tolstoy's diagnosis, many skeptics may wish to shun conversations with anyone who cannot think and talk at our own level. This would be a mistake, even if based partially on reality. It's easy for us to congratulate ourselves for our critical thinking abilities, but harder to realize that these same abilities do not make us morally superior to anyone, incapable of learning from nonskeptics, or exempt from the responsibilities of teaching others.

If skeptics truly wish to further the cause of rationality, we have to be active members of an often-credulous society. This often requires an enormous amount of patience, but this patience is not misplaced. One truly heartening fact is that, as philosopher Julian Baggini has pointed out, the rules of argumentative logic seem curiously self-evident when spelled out. Most people seem to be able to understand the difference between good arguments and bad ones at some level, even if they don't always honor this difference in practice. Many people also seem capable of recognizing fallacies of language, and generally do not relish the idea of being ignorant. All of these facts persuade me that the efforts of skeptics really can bear fruit, even if many more bare branches remain at any given time. We should not succumb to our frustrations so readily.□

# Judging Authority

*We are often required to accept the word of another person, but how can we best judge whether or not that person is a legitimate authority?*

JERE H. LIPPS

Living well requires that we be able to evaluate our environment rationally. Simple things, like crossing the street, shopping, eating, and listening to our doctors, involve three skills: critical thinking, evidential reasoning, and judging authority. Many people, including previous authors writing for the SKEPTICAL INQUIRER (Lett 1990; Wade and Tavris 1990), have discussed the first two of these. Here I focus on the last of them, *judging authority*, but I must revisit the other two first because they are central to it. These same skills are fundamental to scientific reasoning as well, since the ordinary person and the scientist both need to understand our personal or scientific surroundings. Indeed this short article is an outgrowth of material I present to

science students first learning the methods of science, but this should not discourage the nonscience reader, for science and everyday life are far closer in function than most would suppose.

There may be little here not fairly obvious to those of you long involved in issues of science and skepticism, but perhaps it can be of some use in your dealings with students, friends, colleagues, and the wider public.

## Critical Thinking

Critical thinking involves eight skills. These skills require that you understand the problem clearly, consider all possible views about the problem, set emotion aside, and be willing to be flexible when solutions are imperfect. The skills will aid you in dealing with the problem.

| Skills | Simple techniques |
|---|---|
| 1. Ask questions: be willing to wonder | Start by asking "Why?" |
| 2. Define the problem. | Restate the issue several different ways so it is clear. |
| 3. Examine the evidence. | Ask what evidence supports or refutes the claim. Is it reliable? |
| 4. Analyze assumptions and biases. | List the evidence on which each part of the argument is based. The assumptions and biases will be unsupported and should be eliminated from further consideration. |
| 5. Avoid emotional reasoning. | Identify emotional influence and "gut feelings" in the arguments and exclude them. |
| 6. Don't oversimplify. | Do not allow generalization from too little evidence. |
| 7. Consider other interpretations. | Make sure alternate views are included in the discussion. |
| 8. Tolerate uncertainty. | Be ready to accept tentative answers when evidence is incomplete, and new answers when further evidence warrants them. |

Table 1. Skills involved in critical thinking (Wade and Tavris 1990) and simple techniques for achieving them.

The first three critical skills in table 1 may be self-evident, but the others are often difficult for people to practice because of human nature. The analysis of assumptions and biases requires a certain amount of personal insight. We all have biases based on our past experiences and personal beliefs, but we must try to set them aside when we need to understand the way the world works. This is often very difficult to do, because we are not even aware of many of our personal biases. One way to identify bias is to make a list of your feelings and knowledge about the subject. Then apply the evidence. If it does not support your feeling, perhaps the feeling is unjustified. Later, after examining other factors, you can return to this issue with a better understanding of your own emotional biases. If in conflict, your feelings should probably be suppressed in favor of evidence.

The last three items are particularly difficult. We all need explanations, and we tend to jump to conclusions based on too little evidence. Again, an analysis of the evidence is required to determine if it is sufficient. Alternative interpretations should always be sought, even if the evidence seems compelling. In science, this process is known as the "method of multiple working hypotheses," an especially powerful way of approaching the truth (Chamberlain 1897; Platt 1964; Lipps 1999). Does the evidence allow for other possible interpretations? Try to think of other ways to account for the observation or phenomenon you are interested in.

And last, tolerate uncertainty. No one likes uncertainty in our lives—we all want, perhaps need, to know things such as what is before us, why things happen to us, and what happens when we die. Although difficult, tolerating uncertainty can be done by simply setting aside the uncertainties and, for the moment at least, accepting them and moving forward.

## Evidential Reasoning

Evidential reasoning should be used in our daily lives, as it is in science, to evaluate various problems and claims that confront us. We might even make such claims ourselves. All claims should, ideally, be subjected to an analysis like that outlined in table 2.

Of these points, perhaps the most critical is the last one. *Any claim must be sufficient. In other words, you do not have* to prove that the claim is false in order to test it; the claimant must provide sufficient proof himself. Second, the more extraordinary a claim, the more extraordinary the evidence must be to test it. For example, if a person claims that some herb has cured his cancer, you would be well advised to seek a good deal of further supporting evidence before risking your own life. Or if a person claims to have an extraterrestrial being in her garage, do not accept a photograph as proof—demand a piece of it for further study. And last, the word of someone is never sufficient to establish the truth of a claim. This article addresses this last issue, judging whether or not that authority is worth considering.

## Judging Authority

The evaluation of authority requires special consideration because all of us must depend on authorities for information almost daily. In science too, we scientists rely on other scientists for certain kinds of information or data, simply because we cannot know enough about everything. Scientific papers are scattered through with references to the work of others. The evaluation of those works and their authors are part and parcel of science. It should be so in general life too.

Who can we trust to help us in our daily lives? That question is not easy to answer. A scientist dealing with auto insurance may be as susceptible to pseudo-authority in that area as anyone else. A politician listening to a case for particular legislation may be incapable of judging the claimant, and thus vote

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incorrectly. A housewife may listen to glamorous stars pitching a particular useless household product on television, and buy it. *Everyone* is vulnerable to incorrect judgment of authority.

I present some general guidelines for judging authority, but each case may differ and so require additional methods. These additional techniques usually take the form of further probing questions. We all judge authority but sometimes in the emotions or heat of the moment, we forget to question authority. If the authority cannot pass the general guidelines below, don't believe him (or her). Of course, these are not the only ways a person needs to judge authority, for the skilled charlatan will find ways around any such guidelines. Be alert.

1. Most important, does the authority use the skills of critical thinking and evidential reasoning listed in tables 1 and 2? If not, question him using those very skills yourself, and don't believe him until he produces the evidence required.

2. Does the authority have proper credentials? Considerable study or experience in a subject along with the appropriate learning tools are required to become an expert in any field. Does the authority have degrees from a recognized college or university that has the faculty, libraries, and other facilities for proper education in the subject? Has the authority worked in the field for some time for an organization that is known for and equipped for competent dealings in the field?

3. Does the authority have proper affiliations? Is she identified closely with a reliable organization, such as a university, museum, government agency, hospital, or corporation that practices the subject? If not, ask how she makes a living.

4. Does that organization have a stake in the claims made by the claimant? Be suspicious of anyone making claims that support the position or product of their own organization. Seek independent evidence that the claim is correct. This may be hard to do for even relatively common decisions we face, but in its essence, this is simply "comparative shopping." A good comparative shopper is interested not merely in relative costs, but also in the range of products or services available, the quality of the products or magnitude of the services, warranties, and service contracts. Does the expert provide this information, or does he pressure you to decide before you are ready? Be careful of those who will not allow you the time for a carefully reasoned decision.

5. Has the authority subjected his or her work to peer review? In other words, have other experts evaluated the work so that some independent assessment has been made positively? If not, seek that evaluation yourself or find another authority. In our day-to-day dealings, such information is available on the Internet, Better Business Bureaus, and consumer affairs magazines and agencies.

6. Is the authority a demonstrated expert in the relevant field? Other trustworthy people should rely on this person's expertise. Do other experts cite their conclusions? If not, find another authority who others do rely on. Do people you know who have used this person's expertise recommend him?

7. Does the authority present arguments without undue call on unsupported or untenable claims? Does the authority present sufficient evidence to evaluate? If not, find an authority that can provide evidence supporting the claims.

8. Does the authority have a past record of making rational claims backed by evidence or not? Check the usual business sources and your friends.

Even when an authority passes these tests, be aware of lapses that may reveal the degree of knowledge possessed by an expert. Well-known or highly honored people are commonly asked to comment on subjects outside their own field of expertise. We are plagued by testimonials provided by actors, sports figures, television personalities, and a host of others, but do they possess any particular knowledge that would make them an authority on what they are pitching? Probably not. These people should be subjected to exactly the same questions as an unknown authority to determine how much you should rely on their statements. Does a Nobel Prize winner in physics, for example, have any credibility when making pronouncements about evolution? It seems unlikely because the evidence and hypotheses about evolution are very far removed from the usual literature and knowledge base of physics. Be suspicious. Question authority. Use critical thinking and evidential reasoning.

| Rules for evidential reasoning | What to do |
|---|---|
| 1. Falsifiability | Conceive of all evidence that would prove the false claim |
| 2. Logic | Argument must be sound |
| 3. Comprehensiveness | Must use all available evidence |
| 4. Honesty | Evaluate evidence without self-deception |
| 5. Replicability | Evidence must be repeatable |
| 6. Sufficiency | A. Burden of proof rests on the claimant<br>B. Extraordinary claims require extraordinary evidence<br>C. Authority and/or testimony is always inadequate |

Table 2. Rules for evidential reasoning (Lett 1990), or a guide to intelligent living and the scientific method (Lipps 1999). All claims, whether scientific or not, should be subjected to these rules in order to ensure that all possibilities are considered fairly.

In our daily lives, pseudo-authorities are always making one claim or another to sell you something. Ask questions of your insurance salesman, your plumber, your doctor, your housekeeper, or anyone else that you may depend on for important or essential services and products. Proper judgment of authority can save you money and perhaps a good deal of grief too.

So critical thinking, evidential reasoning, and judging authority are essential to living an intelligent, full, happy, and good life. These are worth considering carefully in our daily lives!

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# A Geologist's Adventures with Bimini Beachrock and Atlantis True Believers

*Natural submerged beachrock off the island of Bimini in the Bahamas has been deemed a remnant of Atlantis by the faithful since the 1960s. In spite of geological research demonstrating the stones are natural, "true believers" continue to be drawn by the strong "force field."*

EUGENE A. SHINN

There are many stories like Champ, the Loch Ness monster, UFOs, and other popular myths that seem to acquire a life of their own. In fifteen feet of water off the Bahamian island of Bimini lie several rows of tabular limestone boulders that "true believers" adamantly contend are remnants of the mythical city/state of Atlantis. The reader has probably seen these underwater stones on numerous TV shows and documentaries. Even the History Channel recently did a piece on it. The programs follow a familiar theme: After showing and describing the wonders, the narration will end something like, "No one really knows the true origin of these stones . . ." or, "Could it really be Atlantis?" True believers, of course, have made up their minds.

As a geologist I did a thorough study of the site in the mid-1970s and must say it was one of the more unusual phases of my career and the major reason I first began subscribing to the SKEPTICAL INQUIRER. In the mid-1970s I was director of a small field station for the U.S. Geological Survey (USGS) located on Fisher Island off Miami Beach. We worked in collaboration with the University of Miami's Rosenstiel School of Marine and Atmospheric Science. Our reputation was enhanced because we had developed a diver-operated coring device that for the first time allowed inexpensive underwater core sampling. It was because of our core drill that a well-known writer, adventurer, and New Age thinker, Peter Tompkins, asked if we would go to Bimini (just fifty miles from our field station) to core and determine if the site could indeed be lost Atlantis. We refused the first request, fearing damage to our reputations. The prospect was outside our mission. After Peter contacted our headquarters in Reston, Virginia, I received a phone call. When I explained that the limestone blocks had previously been identified as natural beachrock, I was advised to make my own decision.

I knew something about the so-called "cyclopean megalith roadway" because a Miami graduate student, John Gifford, had recently completed a study of the stones sponsored by the National Geographic Society. The study was published several years later (Gifford and Ball 1980). After consultation within our group, we decided on a plan that promised to be interesting and fun yet provide a public service while at the same time not embarrassing to the USGS. Who could turn down an opportunity to dive in the clear waters off Bimini on weekends at no cost? We agreed to do the investigation on weekends, provided we could pick the boat and the captain. The first weekend trip was aboard a Florida Institute of Technology research vessel that supplied student help. Peter Tompkins also brought along his fourteen-year-old son. We cored two of the huge stones and demonstrated to our satisfaction that they were indeed beachrock.

Beachrock is rock that forms near mid-tide level beneath the sand on tropical beaches. It is a very distinctive rock that forms rapidly. Tidal fluctuation constantly forces calcium carbonate-rich waters through the sands where evaporation and off-gassing of carbon dioxide probably help stimulate precipitation of calcium carbonate. Within a few years, crystals of aragonite, a common marine form of calcium carbonate, precipitate between the grains, welding them together to form a very hard limestone. There are beach rocks around some Pacific islands that contain human skeletons and shell casings from World War II. At Bimini and along other Bahamian islands, many swimming beaches are lined with beachrock that is forming today. They contain imbedded Coke and beer bottles. When sea level rises, as it has done during the past 18,000 years, any beachrock that formed several thousand years ago becomes submerged. Such is the case with the supposed Atlantis stones off North Bimini.

When our drill cores showed the older beachrock was identical to that forming on the main swimming beach at Bimini, there was much concern. Whereas the modern rock contains discarded bottles, there were no artifacts, no wheel ruts, or any other evidence of an ancient civilization in or around the fifteen-foot-deep site. We thought the quest was over and there would be no more fun weekends in Bimini. Instead it was just the beginning of a long adventure that continues today.

When confronted with the beachrock evidence, Tompkins posed a difficult question: "What if beachrock was the only building material available for the Atlanteans?" We needed an answer, so we approached the question using forensic geology. If the stones had not been moved since they formed, they should all contain beach sand stratification dipping in the same direction as when it formed, i.e., toward deep water. If

Figure 1. Diver drilling cores on the "road to Atlantis" in fifteen feet of water off Bimini. The core lying next to pipe wrenches in foreground is four inches in diameter.

the stones had been placed by humans, then internal stratification probably would dip in different directions. We reasoned that Atlanteans, although reputed to have had advanced technology, were not aware of internal stratification within beaches and beachrock. If they fitted the stones, they surely would have selected for the best fit. Thus, some stones should contain

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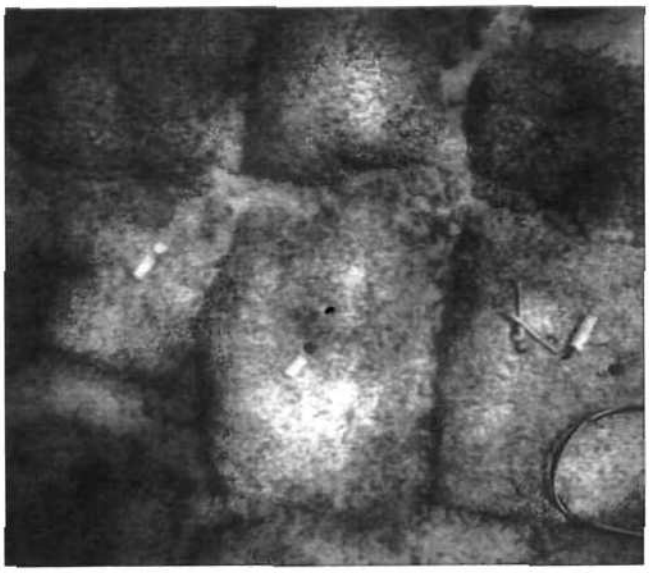

Figure 2. Vertical view of Bimini stones. Note the 4-inch-diameter core hole and oriented cores adjacent to hole. Beachrock like this can seem dramatic and artificial but in fact is a natural geological phenomenon.

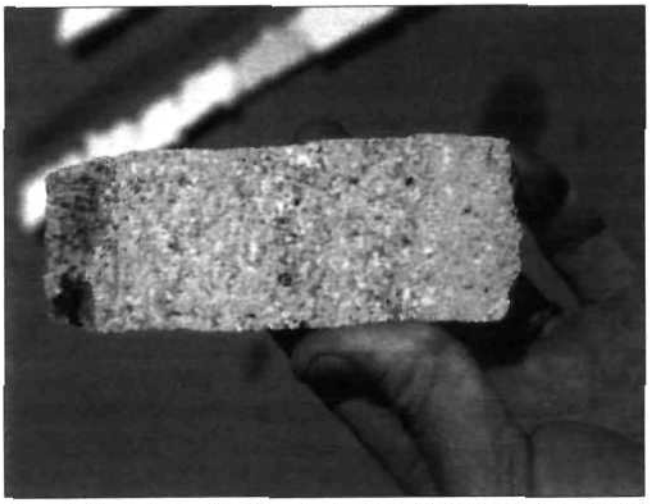

Figure 3. View of sawed surface of a two-inch-diameter core from Bimini beachrock from the first expedition. Coarse shell fragments that compose the rock are roughly the same size as those on the present-day swimming beach at Bimini.

Figure 4. Submerged beachrock at Hospital Key at Dry Tortugas. Thickness of tabular rock slabs and pattern of fractures are similar to those at Bimini.

stratification dipping the wrong way. Our plan was to take seventeen oriented cores from separate adjacent stones. Soon we had a real expedition planned, and a local PBS station was brought in by Tompkins to supervise a documentary. Tompkins is known for his well-crafted coffee table book on the Great Pyramids, his cult classic *The Secret Life of Plants*, and a thriller titled *A Spy in Rome*. Peter actually was an Allied spy in Rome during World War II.

## Cayce's Stones

Why did people believe Atlantis was near Bimini in the first place? The answer lies in the predictions of Edgar Cayce, a popular "healer" in the 1930s and 1940s. Cayce, known as the "Sleeping Prophet," also believed in reincarnation. While doing a "reading," he reportedly discovered his patient was a reincarnated Atlantean. When asked where Atlantis was, the patient said "in the Bahamas near Bimini." This comment, along with others, was recorded in his writings. Cayce became so popular he went on to form a huge following including a foundation in Virginia Beach, Virginia. His story is told in the January/February 1996 issue of SKEPTICAL INQUIRER (Beyerstein 1996). Thus, when someone familiar with his pronouncements discovered the rows of stones in the early 1960s, they were linked with Cayce's revelation. One such person to make the link was Valentine (1976). Soon hundreds of snorkelers and divers descended on the site. The vista in clear water is impressive, and without specialized knowledge, most visitors would swim in awe. The Cayce Foundation funded Edward Zink to investigate. Zink, a professor of English, spent several summers examining the site. Prentice Hall published his hardcover book on the topic, titled *The Stones of Atlantis*.

Other events and circumstances added aura to the island. Bimini lies in the so-called "Bermuda Triangle," and the Berlitz books on the Bermuda Triangle and Atlantis were becoming as popular as crystal power. Berlitz's books included the stones, submerged Egyptian pyramids, whirling compasses, downed airplanes, missing boats, aliens, and anything else that seemed strange. Chief among the auras was the so-called "force field." And there were plenty of other strange happenings on Bimini that might explain the force field. Bimini had become a major drop area for drug smugglers, as it had been for liquor in the 1920s and early 1930s. The aroma wafting from boats in the harbor probably created its own force field. It was a place where Customs agents wore gold Rolexes and small machine-gunned aircraft lay in the bushes on either side of the runway at South Bimini airport. Several can still be found in shallows just off shore. Little wonder that a most unusual crop of international visitors flocked to the tiny island. One visitor was Lester Hemingway, the brother of Ernest Hemingway. He would stop people on the street and describe how the legendary Fountain of Youth, yet another facet of the Bimini aura, had healed his cancer. A tidally fed sinkhole in the mangrove swamps of North Bimini had become the true Fountain of Youth. It was said that Ponce de Leon had mistakenly searched Florida for the Fountain when it was in Bimini all the time. For about $50 local bonefish guides will take you to the Fountain for

rejuvenation. Also near the fountain are sand spits surrounded by mangroves and other vegetation. They are geological testament to the way North Bimini has formed over the past 1,000 to 2,000 years. At one spit, bare sand being encroached by mangroves outlines the shape of a 500-foot-long shark. There is also a whale shape. Because the shark and nearby whale "mega pictographs" or "zoomorphic mounds" can be seen only from the air, true believers say it is a prehistoric archaeological site built by extraterrestrials from the Pleiades. With this background, the reader can more fully appreciate the eclectic, New Age nature of Bimini in the 1970s.

## Drilling for Atlantis

The day finally came to start the drilling. We loaded Captain Roy's fifty-foot trawler with our equipment and two members of Tompkins's entourage. An astrologer from California named Leon had provided funding. The local PBS station sent one of their managers to evaluate the story potential. When we docked in Bimini the next morning, the rest of the group that had flown over was there to meet us. The group included a French photojournalist, a writer from the *National Enquirer*, a woman who practices rebirth, two sisters who were to be the underwater movie photographers, and of course Peter Tompkins. His son stayed home this time. My wife, Dan Robbin, and his wife also joined the party. Captain Roy knew the site well. He had been chartered earlier to help with the filming of a fictional movie about the Bermuda Triangle. A half dozen sailboats had already assembled at the site when we dropped anchor. The people on the sailboats had dropped more than their anchors: they were all naked. One nude boater swam over and asked, "Can't you feel the force field? It's strong here." But this did not fully prepare us for what came later.

We suited ourselves in dive gear and soon found ourselves being filmed by two naked women. Apparently, humans just cannot get the feel of place while wearing clothes. In his 1997 book *Paradise Fever*, subtitled *Growing Up in the Shadow of the New Age*, Ptolemy Tompkins, the same fourteen-year-old son from our first trip in the mid-1970s, talked about life with his father and his New Age beliefs. In the book Ptolemy describes how everyone felt they had to get naked to investigate the stones. He also mentions his father's disagreements with the "clothed geologists." For further reading see "Lost Atlantis" in *Harper's* magazine (Tompkins 1997).

I should also mention that the week before our expedition Peter had rented a plane and flown over the area with two well-known diviners. I was told they first found "hot spots" by passing their hands over nautical charts. They then sat in the plane with plumb bobs and waited for "the forces" to direct them. Needless to say, nothing came of it, but it was to be part of the TV documentary.

While we were drilling, a rival New Ager was spotted on a nearby boat. Demitri Ribikoff, an inventor and developer of underwater photography equipment, was doing an underwater photographic survey of his own. I was soon to learn that the true believers, and there are many, were extremely jealous of each other because each wanted the glory of finding Atlantis. Ribikoff was coaxed over to our boat for an on-camera interview. Sparks flew.

## Analyzing the Atlantis Beachrock

We survived it all, completed our weekend mission, took the cores home, and later sawed the oriented cores with a diamond rock saw. The rock slabs were x-radiographed to reveal internal stratification. Sure enough, all the cores showed consistent dipping of strata toward the deep water, and distinctive layers of rounded beach pebbles could be traced from one stone to another. To better appreciate what this means, let me explain a little about beachrock formation.

Figure 5. Fractured beachrock at Loggerhead Key, Dry Tortugas.

Beachrock forms beneath the sand in the intertidal zone. Nearly all beach sands have distinctive stratification that dips downward toward the water. When the sand is converted to rock, stratification is preserved. Usually one does not see the rock forming on beaches because it forms out of sight beneath the sand. As more sand is added, the beach builds out with the rock following just beneath. However, if conditions change and the beach is eroded, the rock is exposed. Algae grow on its surface, usually turning the rock dark grey or black. After a few years in the sun, the rock layers, usually about one-foot thick, crack much like old concrete roads and sidewalks. The pieces can be large, up to twelve feet in length and four to six feet

wide. With continued erosion by wave-driven beach sand, the cracks enlarge and take on a rounded shape. The result is rows of huge pillow-shaped stones that appear to have been fitted neatly together, much like the stone walls high in the mountains at the Peruvian ruins of Machu Picchu. If the beach makes a turn, such as when a curved spit forms, the beachrock follows. At the south end of the long row of stones off Bimini the beachrock curves to form a huge "J." True believer Edward Zink thought the J shape had special meaning. Some say it was built to form an Atlantean harbor.

Figure 6. Close-up photograph of fractured beachrock at Loggerhead Key, Dry Tortugas. A recent hurricane exposed more beach rock at Loggerhead key, revealing that a seawater pipe for the Carnegie research lab located here between 1910 and 1940 had become part of the beachrock.

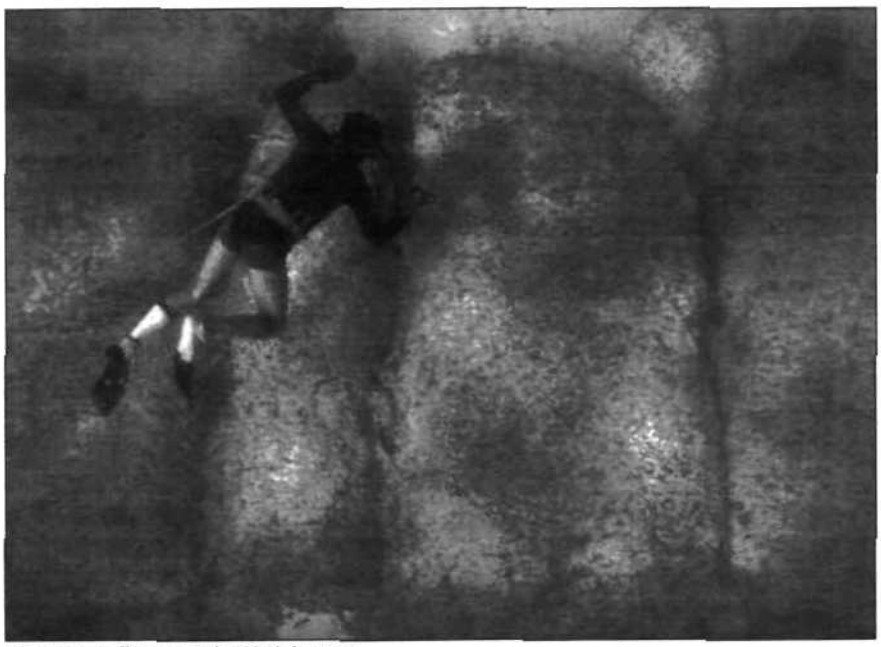

Figure 7. A diver over the Bimini stones.

We were later filmed in our laboratory cutting the cores and explaining their origin and significance on camera. It turned out that the 16-mm film both above and below water was not up to PBS standards and PBS wanted no part of this story. After all this effort—and the discoveries we had made—I decided the geological story needed telling. So I prepared an article for *Sea Frontiers* magazine, which was published by the International Oceanographic Foundation. It was called "*Atlantis: Bimini's Hoax*" (Shinn 1978). The editor was especially happy to print the geological explanation because of the constant onslaught of questions concerning the mysterious stones. Later in 1980, I co-authored a paper in *Nature* with Marshal McKusick (McKusick and Shinn 1980). We presented carbon-14 data showing that the stones (ages range from 2,000 to 4,000 years) are much too young. Atlantis was presumably a 7,000-year-old story when first told to Plato. The rock is actually younger because the material we dated consisted of conch shell fragments cemented within the rock. These materials would have been lying on the beach and predated the cementation process that produced the rock. We did not have the new mass accelerator dating methods that today allow dating of the tiny individual crystals that formed the rock. It is clear the actual time of rock formation would have been some time after the conch shell was deposited on the beach.

## The Myth Goes On

There were also other items in the area. An earlier letter to *Nature* (Harrison 1971) showed that so-called columns on a site about two miles from the stones were made of Portland cement. In the 1800s, cement was carried on ships in wood barrels. When discarded, the wood rotted away, leaving a hard cement column. Needless to say, none of these publications changed the minds of "true believers." I had foolishly believed publishing the facts would put an end to speculation and the numerous expeditions that were being financed by gullible donors. Readers of the SKEPTICAL INQUIRER and those who have read of James Randi's encounters with faith healers and their followers as well as his exposé of the Bimini beachrock (Randi 1981) already know that there is no quelling the fervor of true believers.

So what has happened since the 1970s and early 1980s?

There was indeed a short period of quiescence that may be attributed to a conservative political twist in the nation and possibly the reduction of drug smuggling through Bimini. Today the boat harbor in Bimini is almost empty. In the 1970s, there were always more than 100 boats in the harbor.

In the 1990s, William Donato formed the Atlantis Organization and in 1997 initiated an aerial survey called "Project Alta." Donato received a master's degree from a California university for a critical re-evaluation of the Bimini site in 1979. In the thesis I am accused of not having an open mind. Such criticism is not new. I had been taken to task in a *Miami Herald* interview of true believer Manson Valentine. He accused me of being a "scientoid." "Scientoids are brainwashed in the scientific method which can only reveal limited information," he said. "One has to go beyond the bounds of science for true enlightenment." Valentine was on the board of the Miami Museum of Science!

The dubious expeditions have resumed, and the Bahamian government continues to promote the area for obvious tourism reasons. Edgar E. Cayce, the son of Edgar C. Cayce published a book in 1988 titled *Edgar Cayce's Wisdom for the New Age: Mysteries of Atlantis Revisited.* The book is a hodgepodge of history, geological fact, and fantasy and includes interpretations of Cayce's readings that purportedly show he learned of continental drift while in a trance long before geologists figured it out. Of course, the book discredits the work McKusick and I did.

Three years ago I was invited to give a talk about the Bimini stones to the Bahamian Historical Society in Nassau. The invitation was stimulated by two back-to-back articles in the *Bahamian Guide*, an expensive guide to doing business in the Bahamas. William Michael Donato argued that straight lines are rare in nature while geologist Paul Hearty argues straight lines are not unusual. The straightness of the stones, except where they form a "J," had bothered many observers over the years. The trip to Nassau also included a tour of the multimillion-dollar Atlantis hotel on Paradise Island. The manager led the tour, which takes one through a winding man-made tunnel called "the Atlantis digs." The tour includes an Atlantean submarine, an Atlantean diving suit, a laboratory complete with "power crystals," and hieroglyphics line the walls everywhere. The manager explained how he and others sat up one night and concocted the hieroglyphics. "True believers spend hours in there trying to decode what they say," he said. The pseudo-Atlantis site is also adjacent to an elaborate Las Vegas-style gambling casino. I concluded that anyone who thinks they will get rich gambling should certainly believe in Atlantis.

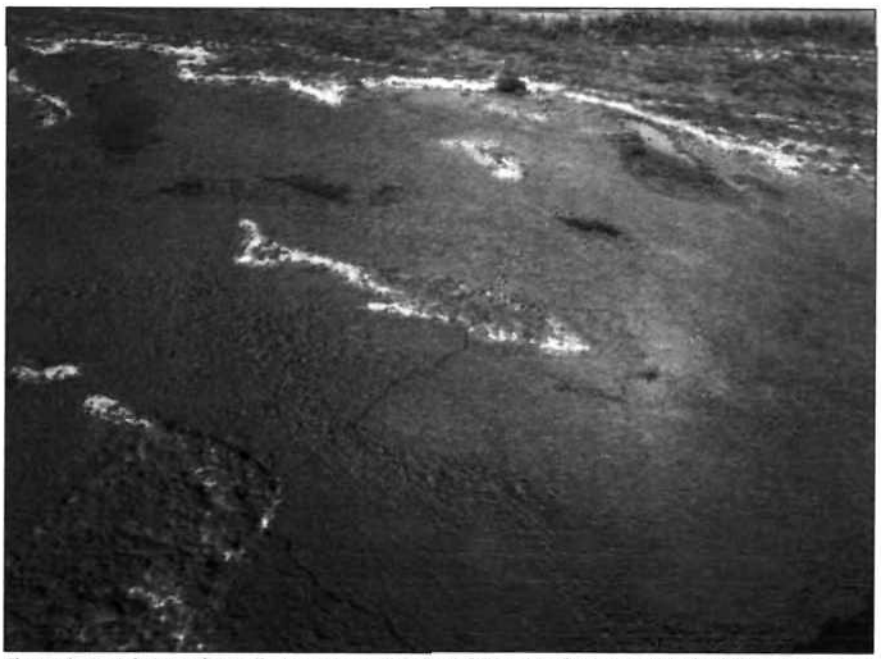

Figure 8. Aerial view of so called "zoomorphic mounds" on North Bimini with shark figure in center of photograph. Accretionary sand spits and shoreline are visible in background. The feature in lower left is said to represent a whale.

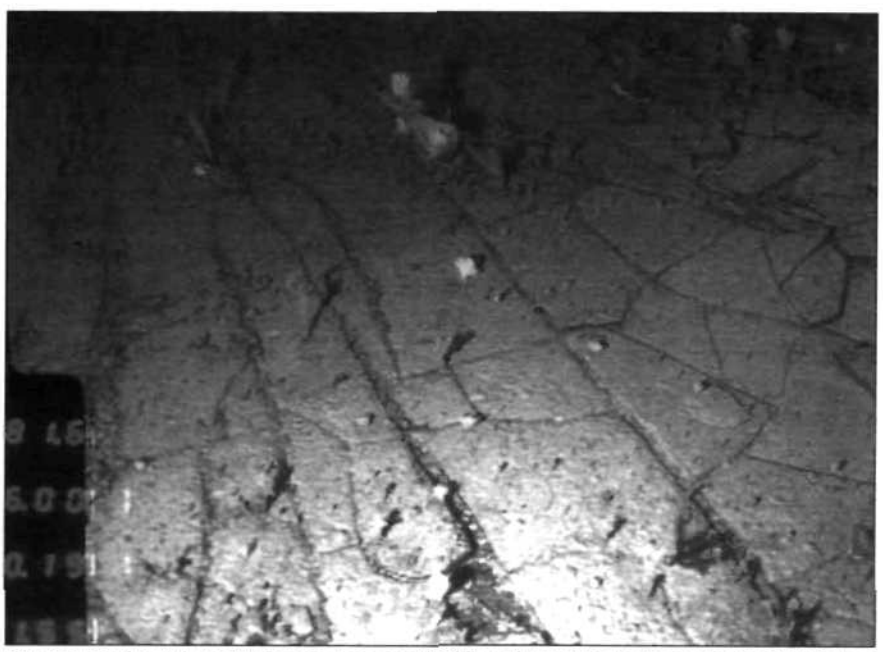

Figure 9. Road to Atlantis? Not quite. Fractured bedding plane taken by the author in 5,000 feet of water from the *Alvin* submersible off the Blake Escarpment.

Since our original adventure, I have seen similar straight lines of broken pavement-like stones and have photographed

similar features from the *Alvin* submarine in 5,000 feet of water. Many more offshore beachrock sites have been found in the Bahamas, and I have photographed a large field of the "megaliths," as true believers call them, off the western end of Vieques Island, Puerto Rico. There are exact duplicates around islands on the Australian Barrier Reef, and a geologically famous example at the Dry Tortugas off Florida in the Gulf of Mexico. I took a film team from Leonard Nimoy's *In Search Of* series to the Tortugas to film and demonstrate that the beachrock there was the same as at Bimini. That 1970s program still airs occasionally but seems not to have influenced the true believers. In fact, several of them appear in the program. One talks of finding a half-buried pyramid on the Great Bahama Bank. They claim to have entered the pyramid underwater to make films and then a storm drove them away. Not surprisingly the films were fogged by the "force field" and the site was buried and could never be located again! They did recover one of the "power crystals." It was demonstrated that when a magnet on a stick is placed near the crystal, the magnet is repelled. The program did not show the electromagnet hidden under a black cloth just beneath the crystal.

In spite of all the evidence pointing to natural beachrock, the reader should not expect to see the demise of Atlantis stories. Donnelly, who in 1882 published *Atlantis: the Antediluvian World*, surely had no idea of its ongoing effect on peoples' lives clear into the twenty-first century. Do not be surprised when you pick up the newspaper and see a small article that says, "Russian expedition finds what may be the true location of Atlantis." It happens at least once a year.

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For many centuries scientists and philosophers have believed that with the advance of scientific knowledge, literacy, and education, humankind would become liberated from ancient fears and superstitions, and that a wider and more humane ethical outlook would develop. It was thought that scientific inquiry could be applied to moral values and modify them in light of their causes, means-end considerations, rational consistency, and with regard for their empirical consequences. But there are powerful forces that oppose the application of scientific reason to morality. As a response, this conference will discuss how and in what way science is relevant to ethics.

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# The Real Method of Scientific Discovery

*Scientists don't sit around in their labs trying to establish generalizations. Instead they engage in mystery-solving essentially like that of detective work, and it often involves a creative, imaginative leap.*

BURTON S. GUTTMAN

Scientists and detectives are engaged in similar quests: to penetrate mysteries about the structure of the universe and about how events happen, or how some particular events have happened. To solve their mysteries, they use certain patterns of logical inference. Arthur Conan Doyle had his famous hero, Sherlock Holmes, claim again and again that he was using the science of deduction. But as Massimo Pigliucci (2003) pointed out recently in the pages of SKEPTICAL INQUIRER, Doyle chose the wrong word. The logic of detection, and of science, is not deduction at all. Deduction simply allows us to work through verbal puzzles and determine, for instance, that if some Aargs are not Blobs and all Crans are Blobs, then some Aargs are not Crans.

However, Pigliucci has taken the stance that the logic of science and detection is actually induction, "the opposite of deduction." Induction is the pattern of reasoning that is supposed to develop generalizations out of particulars—that produces the generalization that "All crows are black" from the particular observations, "Crow number one is black," "Crow number two is black," and so on. It is certainly correct that deduction, carried out according to rules established even by Aristotle, derives certain truths, assuming it begins with true premises. And it is equally true that induction, which may begin with irrefutably true observations, cannot yield a certain conclusion, as witnessed by the difficulty created by one albino crow. This fact about induction, we are told, is the difficulty that makes science fall short of telling us indubitable truths about the world.

## The Scientific Method

All this might be correct if induction were, indeed, the logical method of science. Unfortunately, it isn't, even though generations of science students have been told that it is. This is part of a kind of fairy tale about science, which is supposed to operate according to something called The Scientific Method. The idea that there is a single Scientific Method and that induction is a key part of it is one of the most unfortunate fables foisted off on innocent students, and I have often wondered if the very dullness of the method described in textbook after textbook is not responsible for turning many young people away from science. And I wonder why so many scientists seem to accept the idea when a bit of self-reflection would show that it doesn't really describe what they themselves actually do. (I am imagining a letter that begins, "Dear Professor Jones, We are rejecting your paper for publication in our journal, as the research it describes does not appear to have been carried out according to The Scientific Method.") To be fair, I have read recent textbookish accounts of The Scientific Method that describe science more realistically, though I think they miss the truly creative element I discuss below.

Scientists do not use induction as classically described. They do not sit around in their labs trying to establish generalizations about the color of crows or that the sun will rise tomorrow or that a turkey will continue to be fed every day. A little independent observation of scientists will show that, in fact, scientists engage in mystery-solving essentially like that of detective work. The principal difference between science and detection is that the former deals with relatively general mysteries, such as why carbon and silicon tend to form tetrahedral molecules, and the latter with particular mysteries, such as who killed Lord Chumley in his locked study while everyone in the mansion was apparently sipping cocktails in the drawing room.

The late American philosopher Norwood R. Hanson wrote extensively about the actual methods of scientific reasoning and discovery, particularly in his book *Patterns of Discovery*. Hanson quoted at length from the work of physicist and logician Charles Sanders Peirce and credited Peirce with first explicating the real logical pattern of scientific investigation. As Hanson notes, Aristotle set out the patterns of inference: deduction, induction, and a third called *apagoge*, to use the English-letter equivalents of the Greek. Peirce translated this third method as *abduction* or *retroduction*; it follows this pattern:

> Some surprising phenomenon *P* is observed.
> *P* would be explicable as a matter of course if *H* were true.
> Hence there is reason to think that *H* is true.

A scientist does not make a lot of particular observations and then try to generalize from them to some hypothesis *H*. Instead, a scientist confronts puzzles that arise naturally in the course of her work. She ponders them in the light of the intimate knowledge of the system she has developed, and based on that knowledge, she makes a creative leap of the imagination to say, "This would all make sense if *H* were true!" I particularly want to emphasize that creative, imaginative leap, because this is the critical ingredient that makes scientific work different from following a cookbook (or a logic book), which makes it the exciting, challenging, creative human work that it is. This is the element that puts science on a par with the arts and other creative activities as an enterprise worthy of humans.

To emphasize the differences among the three forms of inference, let me quote Hanson quoting Peirce:

> Induction sets out with a theory and it measures the degree of concordance of that theory with fact. It never can originate any idea whatever. No more can deduction. All the ideas of science come to it by the way of abduction. Abduction consists in studying facts and devising a theory to explain them. Its only justification is that if we are ever to understand things at all, it must be in that way.

The uncertainty of scientific generalizations arises not from the weakness of induction but, rather, from the pattern of reasoning that must be used to test a hypothesis once it has been devised. The hypothesis, *H*, must not only explain the "surprising phenomenon" that inspired it but must also have other empirically testable consequences, *C*. We reason hypothetically: If *H*, then *C*. Suppose we do, in fact, observe *C*. We are then tempted to reason:

> If *H*, then *C*.
> *C*.
> Therefore, *H*.

But of course this pattern of reasoning is a logical fallacy, "affirming the consequent." Instead, we are confined to reasoning by "denying the consequent" (*modus tollens*):

> If *H*, then *C*.
> Not *C*.
> Therefore, not *H*.

Thus, no amount of observation that is consistent with the hypothesis can establish it with certainty, though the more it survives empirical tests—particularly if its quantitative predictions accord with observations—the more confident of it we become. It is for this reason that Popper emphasized that a hypothesis must be *falsifiable*, since there is no logical way to make it irrefutably *confirmable*.

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The physicist John R. Platt addressed this problem of inference in emphasizing the power of what he called "strong inference." This method sets up alternative hypotheses that have different consequences: $H_1$ implies $C_1$, $H_2$ implies $C_2$, $H_3$ implies $C_3$. A properly designed critical experiment then yields $C_2$, for instance, allowing us to reason, *modus tollens*: $C_1$ and $C_3$ are not true, therefore $H_1$ and $H_3$ are not true (and therefore $H_2$ is more likely to be true). A classic case of strong inference was the famous experiment of Meselson and Stahl in testing the prediction of the Watson-Crick model for DNA, that replication ought to be semiconservative. By using density-gradient centrifugation, they showed precisely the pattern predicted by this hypothesis and ruled out two alternative hypotheses.

## Astonishing Abductions

**Scientists do not sit around in their labs trying to establish generalizations about the color of crows or that the sun will rise tomorrow or that a turkey will continue to be fed every day.**

Examples of astonishing, creative abductions, or retroductions, abound in the history of science. Arthur Koestler wrote about one of the earliest in his biography of Kepler, *The Watershed*, and Hanson discusses the same episode at length in explaining retroduction. Kepler's mentor Tycho Brahe had made very precise observations of the location of the planet Mars at various times. Kepler differed from Brahe in accepting the new Sun-centered universe—or, more properly, solar system—of Copernicus, and he set out to use Brahe's measurements to precisely define the Martian orbit, naturally assuming that the orbit is a perfect circle centered on the Sun. But Kepler found a discrepancy of eight minutes of arc between the observed and predicted positions of the planet. Kepler could have ignored that tiny discrepancy if he had not been such a fine, critical scientist—Koestler portrays him as one of the first to have crossed over the watershed boundary separating abstract geometric modeling in the Aristotelian tradition from true science combining astronomy with physics. Having crossed over that watershed, Kepler would not rest until he had resolved the discrepancy, and he did so by abandoning the preconception of a circle. He experimented for a time with drawing the orbit as oval, and then finally made the imaginative leap to making the orbit an ellipse with the Sun at one focus. Kepler stumbled into this discovery as a sleepwalker does—the recurring theme of Koestler's whole book—but in effect he reasoned: "This discrepancy of eight minutes of arc is very puzzling. But I could explain the discrepancy if the orbit were an ellipse rather than a circle. Therefore, I have good reason to believe the orbit is an ellipse."

In the early nineteenth century, John Dalton sought to understand the compositions of certain substances in a simple way. For instance, water was known to consist of 88.9 percent oxygen and 11.1 percent hydrogen. Ammonia is 82.4 percent nitrogen and 17.6 percent hydrogen. Dalton's creative act came in the realization that he could explain these unvarying ratios if matter is made of atoms, if every type of atom has a definite weight, and if they can only combine in certain proportions. Thus, he could explain the 8:1 weight ratio of oxygen to hydrogen in water by assuming that an oxygen atom weighs eight units, a hydrogen weighs one unit, and a water molecule consists of one of each—that it has the formula HO. Unfortunately, Dalton persisted in believing that atoms only combine in a one-to-one ratio in the most stable compounds of two elements, thus leading him into errors that were only corrected later by other chemists, building on the essential feature of this theory. Thus, the composition of ammonia was explained if an ammonia molecule consists of one nitrogen atom and three hydrogen atoms. Still assuming that each hydrogen atom weighs one unit, divide the 17.6 percent by 3, to get 5.87 percent for the contribution of each atom. Then 82.4 divided by 5.87 = 14, leading to 14 units for the mass of a nitrogen atom.

Ernest Rutherford's hypothesis of the atomic nucleus was another retroduction. Rutherford was studying the structure of matter by bombarding a very thin gold foil with the alpha radiation from radium and polonium. He knew that alpha particles are large and carry a positive charge. When the gold leaf was irradiated, most of the radiation appeared on the other side of the foil. That was remarkable in itself, because it meant that just as surely as the foil was solid, it must also be full of space through which the large particles could pass. Some of the alpha particles were deflected slightly to the side, suggesting they were being deflected by the gold atoms. But when Rutherford's assistants Geiger and Marsden looked for alpha particles being deflected to greater angles, they found that some were actually coming straight back toward the radium source. That was incredible. It was, Rutherford said later, like aiming a cannon ball at tissue paper and having it bounce back toward you. On the basis of such experiments, Rutherford postulated that an atom is largely empty space with virtually all its mass concentrated in a nucleus carrying a positive charge.

Retroduction, or abduction, is the real method of scientific work, although it generally proceeds by small steps requiring relatively small imaginative leaps. We should tell people about those imaginative leaps. They are more exciting and creative than enumerating crows.

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# Oxygen Is Good—Even When It's Not There

*Alternative medicine's claims for the efficacy of supplemental oxygen are less than convincing—especially when the supplement contains no oxygen.*

HARRIET A. HALL

Oxygen is not just in the air; it's on the shelves. It has been discovered by alternative medicine and is being sold in various forms in the health supplement marketplace. Back when I was an intern, we used to joke that there were four basic rules of medicine:

1. Air goes in and out.
2. Blood goes round and round.
3. Oxygen is good.
4. Bleeding always stops.

Alternative medicine has latched onto rule number three and won't let go. The rationale, apparently, is that oxygen is required to support life; therefore more oxygen should make

you more healthy. It's not clear how this relates to alternative medicine's advice on anti-oxidants, but that's irrelevant.

OXYGEN IS GOOD, so we should put it in our soft drinks and breathe it at oxygen bars. Take an oxygen tank home with you—you might feel better. The oxygen vendor might feel better, too. Dr. Andrew Weil, the renowned health guru, tells patients with chronic fatigue to ask their doctors to prescribe oxygen for a home trial. Sure, why not? The money it costs will literally vanish "into thin air," but who cares? OXYGEN IS GOOD.

Ignore the fact that you could find out whether you need oxygen by testing your blood oxygen saturation with that little-clip-thingy-they-stick-on-your-finger-in-the-ER (aka pulse oximeter). Who cares if your blood is fully saturated with oxygen already? OXYGEN IS GOOD. If your oxygen saturation is a little less than 100 percent, there is no evidence that raising it will help with anything. If it is a lot less, and you do need oxygen, any competent doctor should be able to figure that out. But try an oxygen tank anyway: OXYGEN IS GOOD. Is this starting to sound like a mantra? It should. This is religious belief I am talking about, not science.

## Oxygen Therapies

Just breathing oxygen is boring: any dumb animal can do that. Why not drink it? Alternative medicine found ways to use oxygen in a liquid form. No, not liquid oxygen; that's kind of chilly (around minus 298 degrees Fahrenheit). You could buy a $1,600 home water cooler to infuse oxygen into your drinking water and call that liquid oxygen. Or you could use chemicals that release oxygen. Ozone gives off oxygen. So do hydrogen peroxide and chlorite compounds. They're corrosive chemicals, but if you mix them with liquid and drink them, they will release friendly little oxygen bubbles in your stomach and dilution will counteract the corrosive effect. Corrosion may be bad, but OXYGEN IS GOOD.

Proponents of hydrogen peroxide found it worked wonders for everything from multiple sclerosis and cancer to hemorrhoids and the common cold. They tried bathing in it, drinking it, injecting it into their veins, and pumping it up their rectums. The proponents of hydrogen peroxide never reported any adverse effects. On the other hand, the medical literature reported that hydrogen peroxide caused deaths from gas embolism, gangrene, seizures, strokes, and other complications. How could that be? Didn't those scientists know that OXYGEN IS GOOD?

Could oxygen cure cancer and AIDS? They tried ozone by enema. They tried oxygen under pressure in a hyperbaric chamber. They even put cancer patients into a coma with overdoses of insulin in the hope that it would somehow regulate oxygen delivery to the cancer cells. Scientists insisted there was no proof that these therapies worked, but they couldn't prove to the true believers that they *didn't* work. Scientists insisted that these therapies could be harmful, but how could anything as natural as oxygen possibly be harmful? OXYGEN IS GOOD.

Invention proceeded apace. Alternative "science" found a way to put "electrically activated" oxygen in water. No one knows what "activated oxygen" means, but it *sounds* impressive. OXYGEN IS GOOD, and if it's activated it ought to be even better.

Gerald Fried

Once it has been "activated" in water, you can take oxygen safely and conveniently in the form of drops. You can put a few drops under your tongue, or drink them in a glass of water, and you will feel better. Of course, the amount of oxygen in a few drops of water is many orders of magnitude less than that contained in every breath. Of course, little or no oxygen is absorbed from the stomach. But fish get their oxygen from water, and if fish can do it, we ought to be able to do it too, gills or not! OXYGEN IS GOOD. They recommend that you drink it, spray it in your nose, gargle with it, spray it on cuts, spray some on your houseplants, and spray it on vegetables, chicken, seafood, and pork to decontaminate them. You can even use it as a natural alternative to antibiotics or give it to your pets to prevent doggy breath. OXYGEN IS GOOD—for just about everything.

## Selling Oxygen—Even Without Oxygen

Several brands of activated oxygen appeared on the market, each better than all the rest. Finally, one company came up with the best idea yet. They would sell plain water with a bit of salt and a trace of minerals, charge $10 an ounce for it, and *pretend* it contained activated oxygen.

The Rose Creek Company marketed oxygenated water without any oxygen in it. They said so themselves. Actually they claimed there was oxygen in it that "couldn't be detected" in the laboratory. Their excuse was that the precision equipment couldn't measure *over* 40 ppm of oxygen. I guess if they pour a whole pot of coffee into their coffee cup, the cup stays empty; and if they overinflate their tires they create a vacuum. This probably has something to do with homeopathy or an alternate reality. OXYGEN IS GOOD, even if the lab can't find it.

They called it "Vitamin O." They claimed that it would effectively prevent and treat pulmonary disease, headaches, infections, flu, colds, and even cancer. They claimed that it regulates metabolism, aids digestion, relaxes the nervous system, boosts energy, promotes sound sleep, and sharpens concentration and memory. They were selling 50,000 bottles a month until the Federal Trade Commission (FTC) spoiled the fun. A consent agreement required them to pay $375,000 for consumer redress and to stop making false statements. They were prohibited from "making any unsupported representation that the effectiveness of 'Vitamin O' is established by medical or scientific research or studies."

They changed the name of their company to R-Garden, Inc. and modified their ads, but they weren't happy. They knew that OXYGEN IS GOOD (it was definitely good for business), and they really wanted some scientific studies so they could thumb their noses at the FTC; so they hired the first scientist they could find who would stop laughing long enough to do some tests. They had to settle for an anthropologist. He reasoned that the oxygen that wasn't there should raise the blood oxygen level of people with anemia. So he decided to measure the partial pressure of oxygen and carbon dioxide in arterial blood ($PaO_2$ and $PaCO_2$), hypothesizing that both would rise with "Vitamin O," but not with placebo. This next bit is going to be a little technical, so you may skip the next two paragraphs if you wish.

If you are anemic, you have less hemoglobin to carry oxygen. But the blood gases, the $PaO_2$ and $PaCO_2$, have nothing to do with hemoglobin or anemia. They are measures of gas pressure, not of total oxygen carried by hemoglobin. So people with anemia should have a normal $PaO_2$. They might be able to raise their $PaO_2$ a little by hyperventilating, but this would lower their $PaCO_2$.

Anemic patients *do not* have low $PaO_2$ measurements. In this study, all of the anemic patients *did* have low baseline $PaO_2$. The researcher didn't notice that this was abnormal. When subjects took "Vitamin O" their $PaO_2$ went up, but mostly not up to normal. A couple of them developed a $PaO_2$ of over 100 mm Hg, which is not generally thought to be possible on room air without serious hyperventilation. He didn't notice anything unusual about this. He also discovered that the $PaCO_2$ went up right along with the $PaO_2$. Ordinarily this would indicate hypoventilation, possibly from severe lung disease, but he wasn't alarmed. He thought it would eliminate more nasty waste matter and would probably cause "greater youthfulness, improved mobility, better circulation, sharper mental clarity, enhanced heart and lung functions, and increased physical energy." (Huh?) Of course, in several patients the $CO_2$ went *down* as the $PaO_2$ went up, but this didn't bother him. Apparently he believes, with Ralph Waldo Emerson, that a foolish consistency is the hobgoblin of little minds.

He concluded that he had definitely proved that oxygen is present in "Vitamin O." In other words, if you find unexplained abnormal blood gas values and they change in a way that wouldn't be caused by increased oxygen intake, that proves that oxygen intake was increased, which proves that the increased oxygen intake had to come from the "Vitamin O." His logic didn't work any better than his blood gas analyzers.

His subjects were all Hutterites, members of an Anabaptist sect who live communally in groups of 60–150 on collective farms, mainly in the western U.S. and Canada, and who remain aloof from outside society. He didn't explain how he persuaded them not to remain aloof from his experimental interventions. He noted that "no protocol or consent forms" were needed, since the head minister could make all the decisions for his flock and just order them to cooperate. It seems that Hutterites make even better experimental subjects than prisoners, because you have to get informed consent from prisoners. He didn't bother with any statistical analysis of his data. He didn't provide any references. He didn't expect that anyone would try to replicate his findings. As far as he was concerned, his definitive experiment had proved once and for all that there was oxygen in "Vitamin O." He broke just about every rule of scientific experimentation. After all, he wasn't searching for scientific truth, just for enough words on paper to meet the FTC's requirements.

In another study, the same researcher discovered an

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*OXYGEN IS GOOD—EVEN WHEN IT'S NOT THERE*
*Continued on page 55*

# Contemporary Challenges to William James's White Crow

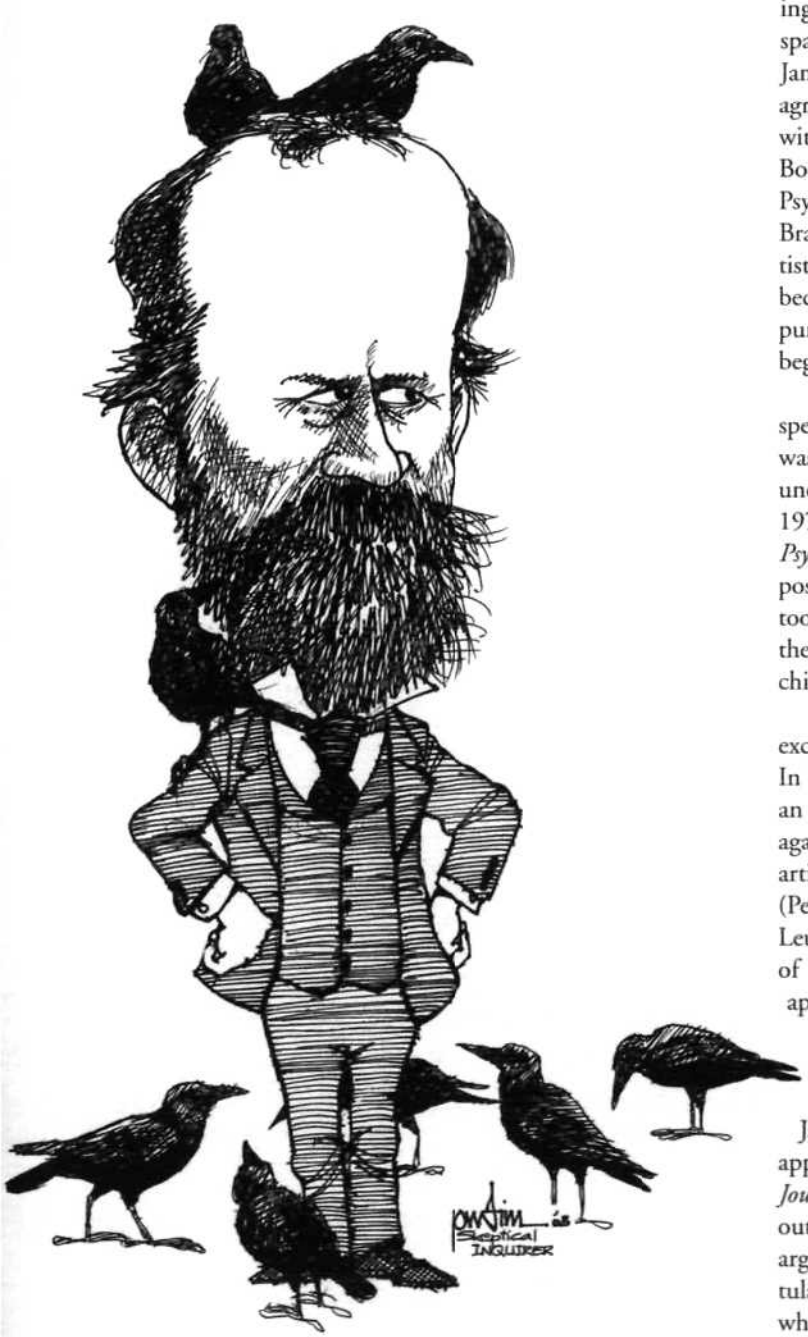
*William James's belief that he had found his white crow, thereby proving the legitimacy of spiritualism as a suitable subject for a science of psychology, evoked strong reaction from psychologists—and from his dying sister.*

HERMAN H. SPITZ

> But when was not the science of the future stirred to its conquering activities by the little rebellious exceptions to the science of the present? Hardly, as yet, has the surface of the facts called "psychic" begun to be scratched for scientific purposes. It is through following these facts, I am persuaded, that the greatest scientific conquests of the coming generation will be achieved. *Kühn ist das Mühen, herrlich der Lohn!* [Hard is the work, beautiful the reward!] (William James 1909b, 375)

William James (1842–1910), eminent professor of psychology at Harvard, made this prediction a year before he died. Yet a century of probing deeper into "psychic" facts has led nowhere. To the contrary, the greatest scientific advances have come from the hard work of mainstream science. As for psychical research, we may as well be back in 1909.

Few students of psychology realize how important a role psychical study played in James's philosophy. In the introduction to their extraordinarily thorough compilation of James's writings on psychical research, Burkhardt and Bowers (1986) commented that their book "clearly shows that psychical research represented a continuing intellectual concern throughout his [James's] career" (p. xiv). As corroboration they cited a statement in Ralph Barton Perry's "indispensable" two-volume study that "James's interest in 'psychical research' was not one of his vagaries, but was central and typical. He grew up in a circle in which heresies were more gladly tolerated than orthodoxies" (Perry 1935, 155). Burkhardt and Bowers, as well as Perry, found this to be a favorable trait, freeing James from prejudice and making him open and often sympathetic to a wide variety of viewpoints. They apparently did not believe that a skeptical attitude would have been more fruitful. As it was, this dichotomy between skeptics and believers led to an acrimonious debate about spiritualism as a proper area of psychological study (Coon 1992).




Skepticism came not only from psychologists who remain in the psychological pantheon but also from psychologists who do not. For example, there is the opposition of James H. Leuba (1903), appointed to the Bryn Mawr College faculty in 1897 and a founder of its psychology department, who published a critique of an article by James Hyslop (1901), a professor of logic and ethics at Columbia University. Hyslop had approvingly described seventeen séances with Mrs. Leonora Piper, sparking a debate with Leuba. Although Hyslop differed from James in his approach to psychical research, he and James agreed on the importance of material gathered from sittings with Mrs. Piper, though James was more cautious than Hyslop. Both continued to actively support the American Society for Psychical Research (which in 1890 had became the American Branch of the Society for Psychical Research) after many scientists, including the eminent psychologist G. Stanley Hall, had become disillusioned when the Society strayed from its original purpose of experimentally exploring psychical research and began to actively support it (Burkhardt and Bowers 1986).

Prior to his appointment to Bryn Mawr in 1897, Leuba had spent three years as a student at Clark University, where Hall was president. Earlier, in 1887, Hyslop had earned a Ph.D. under Hall, who was then at Johns Hopkins University (Moore 1977, 158). Hall's (1891) review of James's *The Principles of Psychology* is only one of many scathing indictments of James's position. In fact Hall, assisted by psychologist Amy Tanner, took the trouble to arrange six séances with Mrs. Piper, and they drew a far different conclusion about the medium's psychic powers than did either James or Hyslop (Tanner 1910).

Leuba also squabbled with James, although their initial exchange of letters gave no hint of the disagreement to follow. In March 1901, James had written to Leuba praising him for an article on religion published in the *Monist.* James wrote again to Leuba after Leuba had published a second, related article in July 1901, and this time James was more critical (Perry 1935). But the paper that most antagonized James was Leuba's (1903–1904) "Professor William James' interpretation of religious experience," which took issue with James's approach to the psychology of religion as expressed in James's *The Varieties of Religious Experience.* James expressed his feelings about Leuba's article in a letter dated August 24, 1904, to Edwin D. Starbuck, who had been a student of James's in the mid-1890s (Starbuck 1943): "I was much disappointed in Leuba's review of my book in the *International Journal of Ethics* . . . I confess that the way in which he stamps out all mysticism whatever, using the common pathological arguments, seemed to me unduly crude. I wrote him an expostulatory letter, which evidently made no impression at all, and which he possibly might send you if you had the curiosity to apply" (H. James 1920, Vol. 2, 210).

James's expostulatory letter,[1] dated April 17, 1904, begins with James "rejoicing" in the way Leuba gets to the heart of James's contentions, but then he objects to Leuba characterizing his (James's) thesis as "spirit intervention." No reader could guess, wrote James, "that the only spirit I contend for is 'God.' Unless he [the reader] knows my book he will suppose that I am a 'spiritist' out and out, which I am not. This is unfair" (Perry 1935, 348–349). James then went on to accuse Leuba of being secretive. "You hide your own religious cards," wrote James, "so that one does [not] know exactly how to reply to you" (359). You may think there is no God, he went on, "and that all these vague experiences are 'poppy-cock' and nerves" (349), or that there is a God, "but that the evidence for him (*sic*) must always be indirect" (349). Or perhaps Leuba believed in the *possibility* of a God, in which case "argument grows easier" (349). James provided that argument in the remainder of his letter.

Ten months later, in a letter to Starbuck dated February 12, 1905, James suggested that Starbuck (who, like James and Leuba, studied and wrote about the psychology of religion) "drive home...[the point] that the anti-religious attitudes (Leuba's, Huxley's, and Clifford's), as far as there is any 'pathos' in them, obey exactly the same logic" (H. James 1920, 218).

Whatever James thought about Leuba's views it did not prevent him from sending his daughter Margaret Mary to Bryn Mawr from 1906 to 1908, at which time she left without graduating (R. H. Wozniak, personal communication, January 28, 1997; and see James's letter to her in his son Henry's collection of William James's letters, 1920).

Before leaving Leuba it should be mentioned that to account for Mrs. Piper's performance he was unwilling to rule out the possibility of telepathy—widely accepted then (and now)—combined with secondary personality, or perhaps just secondary personality alone, an alternative he thought improbable (Leuba 1903). As we know, other explanations are more plausible (Gardner 1996).

## The White Crow

Any discussion of James's spiritualistic bent must begin with Mrs. Piper. James (1890) wrote that he first met her in the Autumn of 1885, and Mrs. Piper's description of how they met is particularly illuminating. "My maid of all work told a friend who was a servant in the household of Professor William James, of Harvard, that I went into 'queer sleeps,' in which I said many 'strange things.' Professor James recognized that I was what is called a psychic, and took steps to make my acquaintance" (Piper 1902, 143). If this was true there would have been an obvious conduit from the James household to Mrs. Piper, and her trance state revelations about the James family, which so impressed James, would have had a more mundane source than the spirit world. Mrs. Piper's daughter, Alta Piper, told a somewhat different story. Her grandparents had a maid whose sister worked in a Boston home frequently visited by James's mother-in-law, Mrs. Gibbens (Alta Piper spelled it Gibbins). Hearing, through this channel, marvelous tales about Mrs. Piper, Mrs. Gibbens requested and received a sitting that so impressed her that she arranged a sitting for her daughter, James's wife, "the results of which appeared equally, if not more, surprising than her own" (A. Piper 1929, 22).

James's (1890) version of how he met Mrs. Piper generally supports her daughter's description, although he made no mention of the role played by the housekeepers. When he was told of Mrs. Piper's powers he went with his wife, "to get a direct personal impression" (652). Whatever the specific connection between the servants, "It is thus possible that Mrs. Piper's knowledge of the James family was acquired from the gossip of servants and that the whole mystery rests on the failure of the people upstairs to realize that servants [downstairs] also have ears" (Burkhardt and Bowers 1986, 397).

In his *The Principles of Psychology*—a two-volume publication that is arguably the most famous book in academic psychology—James (1890) quoted a lengthy autobiographical description of the remarkable output produced during automatic writing by a former member of Congress. The man insists that the writer was not himself, nor his unconscious, but some other intelligence using his mind. What is James's response to this? He accepts it, commenting that he himself is persuaded "by abundant acquaintance with the trances of one medium that the 'control' may be altogether different from any *possible* waking self of the person. In the case I have in mind, it professes to be a certain departed French doctor; and is, I am convinced, acquainted with facts about the circumstances, and the living and dead relatives and acquaintances, of numberless sitters whom the medium never met before, and of whom she has never heard the names" (Vol. 1, 396).

James goes on to observe that he is giving his opinion, "unsupported by the evidence," not to persuade anyone to his viewpoint, but rather because he believes "that a serious study of these trance-phenomena is one of the greatest needs of psychology" (396). Those unfamiliar with James's adventures into mysticism could not know that the medium he refers to in his famous book is Mrs. Piper and her control is Phinuit (a spirit intermediary for other spirits), who claimed that in his earthly existence he was a French physician, although he couldn't speak French. James rationalized this by suggesting that Phinuit was a fictitious person; that is, a real spirit who lied about the nature of his earthly identity (James 1890).

The Leuba-James debate reflected the far better known dispute on the same subject between William James and psychologists G. Stanley Hall, James McKeen Cattell, and Edward B. Titchener. Hall (in Tanner 1910) gave an insightful description of Mrs. Piper and her trance behavior. By the time he and Tanner saw her in 1909 she had for some thirteen years been a star of both the Society for Psychical Research in England

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and its American offshoot, which paid her a generous annual sum, in addition to fees she received from individuals (Burkhardt and Bowers 1986, 396). An important figure in these events was Richard Hodgson, who had been an active member of England's Society for Psychical Research and had arrived from Europe to set the American branch on a firm footing, serving as its salaried secretary from 1887 until his death in 1905 (Burkhardt and Bowers 1986; James 1892), after which he allegedly communicated as a spirit through Mrs. Piper. Hall and Tanner had what the spiritualists believed were lengthy communications with his spirit. In fact, at roughly the time of Hall and Tanner's séances with Mrs. Piper, James (1909a) published an extended paper on Hodgson's spiritual communication via Mrs. Piper, concluding that although there was much dross and rubbish, nevertheless supernormal knowledge was indeed exhibited.

For James, Mrs. Piper was the single exception that disproved a general rule (Moore 1977).

> But it is a miserable thing for a question of truth to be confined to mere presumption and counter-presumption, with no decisive thunderbolt of fact to clear the baffling darkness. . . . For me the thunderbolt *has* fallen. . . . If you will let me use the language of the professional logic-shop, a universal proposition can be made untrue by a particular instance. If you wish to upset the law that all crows are black, you mustn't seek to prove that no crows are; it is enough to prove one single crow to be white. My own white crow is Mrs. Piper. In the trances of this medium, I cannot resist the conviction that knowledge appears which she has never gained by the ordinary waking use of her eyes and ears and wits. (James 1896a, 884)

James Mckeen Cattell (1896) was not persuaded. "One white crow is enough, but its skin should be deposited in a museum" (582–583), to which James (1896b) responded, "But our reports are not of gray crows; at the very worst they are white crows without the skins brought home" (650).

Cattell (1898) would not let the metaphor rest: "The difficulty has been that proving innumerable mediums to be frauds does not disprove the possibility (though it greatly reduces the likelihood) of one medium being genuine. But here we have the 'white crow' selected by Professor James from all the piebald crows exhibited by the Society" (534).

The white crow turned up as a white blackbird during one of Hall and Tanner's sittings with Mrs. Piper. In talking with Mrs. Piper before she went into her trance state, "Dr. Hall recalled to her Dr. James's saying that she was his white crow, and [that she] had made science prostrate in the dust so far as he [James] was concerned, which evidently pleased her greatly" (Tanner 1910, 224). During the trance that followed, Hall supposedly communicated (through Mrs. Piper) with the spirit of Richard Hodgson. At one point Hall caught Hodgson's spirit in an error for having said that it had seen the spirit of Ms. Tanner's father, whereas in fact her father was still alive. Hodgson's spirit then replied, through Mrs. Piper's automatic writing: "I say he is living. Nothing ever dies I say. Dead, no such thing. You do not UD [understand]. Catch me and you will catch a white blackbird. Blackbird" (228).

In discussing the séances, Tanner wrote: "The most distinct case of a memory common to the two states was when Dr. Hall, before the trance, quoted the phrase, 'a white blackbird,' to Mrs. Piper, and in the trance Hodgson used the phrase, 'catch me and you catch a white crow'" (Tanner 1919, 22–23).

But white crow or white blackbird, its skin has yet to be deposited in a museum for public viewing.

Like Hamlet, James vacillated, unable to decide how Mrs. Piper performed her feats. She was still "supernormal," he said, but not necessarily a medium for spirits of the departed. In a letter to Mr. Slattery, dated April 21, 1907, his state of mind was that "Mrs. Piper has supernormal knowledge in her trances; but whether it comes from 'tapping the minds' of living people, or from some common cosmic reservoir of memories, or from surviving 'spirits' of the departed, is a question impossible for *me* to answer just now to my satisfaction" (H. James 1920, 286).

## The Reaction to Mrs. Piper of William James's Sister Alice

William James's invalid sister Alice was not as beguiled by Mrs. Piper as were he, his wife, his mother-in-law, and most members of the English Society for Psychical Research and its American branch. James had once asked Alice to mail a lock of her hair to Mrs. Piper for a reading, but Alice—apparently with the help of her devoted friend Katherine Peabody Loring (Burr 1934)—deceived her brother by sending instead a lock of hair from her nurse's friend, who had died four years previously. Alice later revealed the deception to William and apologized: "I hope you will forgive my frivolous treatment of so serious a science" (Strouse 1980).

If Alice truly believed the science was serious she did not herself take it seriously. In her diary entry of February 28, 1892, a week before she died, she expressed misgivings about what might take place after her death:

> I do pray to Heaven that the dreadful Mrs. Piper won't be let loose upon my defenceless soul. I suppose the thing "medium" has done more to degrade spiritual conception than the grossest forms of materialism or idolatry: was there ever anything transmitted but the pettiest, meanest, coarsest facts and details: anything rising above the squalid intestines of human affairs? And oh, the curious spongy minds that sop it all up and lose all sense of taste and humour! (Edel 1934, 231)

After Alice died Ms. Loring edited her diary and sent printed copies to Alice's three living brothers (Edel 1934).


## Acknowledgments

I thank Prof. Robert H. Wozniak of the Bryn Mawr College psychology department for information about the presence at Bryn Mawr of William James's daughter, and for copying and sending an article I could not locate.


## Note

1. According to Perry (1935), the original of James's "expostulatory letter" is missing; the version Perry published was "made up of several fragmentary versions which have been found among the James papers" (348).

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## *OXYGEN IS GOOD—EVEN WHEN IT'S NOT THERE*

*from page 50*

unbelievably high incidence of chronic fatigue syndrome among the Hutterites, and found that "Vitamin O" relieved their symptoms better than placebo. In his report of that study he gave an intriguing definition of his experimental method:

"The three key features of this approach in assessing the efficacy of natural man-made substance [*sic*] were employed here: randomization, blindedness, and measurement of predetermined outcomes."

I don't know what a "natural man-made substance" is; I agree that some kind of "blindedness" was at work; and if the outcomes were truly "predetermined," that would explain a lot.

In essence, the company funded studies that pretended to be scientific so they could pretend to have proven that the pretend oxygen in their product is really there (and that it really works). This kind of fuzzy thinking is typical of alternative medicine advocates. They ask you to maintain your health with preventive, natural treatments that have not been proven effective, and to mistrust conventional medical treatments that have been proven effective. They exploit fears of pollution, food additives, pesticides, and side effects from pharmaceuticals. They play the science game to appease their critics, but they don't really believe in science: they believe that truth can be accessed through intuition. They seldom disprove theories or report negative results; they rarely search for alternative explanations, suggest that further studies be done for confirmation, or seek peer review. They believe in the mystical ability of the body to heal itself through communication with the vital forces of the universe. How could science understand these complex, holistic phenomena? Scientists aren't even smart enough to sell water for $10 an ounce.

Science doesn't know everything. Intuition counts for something, doesn't it? There are more ways of knowing than scientists can imagine. Anyway, isn't scientific "truth" wishy-washy? Newton contradicted Copernicus, and Einstein contradicted Newton. Paradigms are shifty. Eventually scientists will have to give up their materialistic theories and will come to understand that the Universe is just one big mind interconnected by a continuum of ineffable cosmic quantum something-or-others.

Proponents of alternative oxygen therapy will never be convinced it doesn't work. As Lewis Carroll explained in *Alice in Wonderland,* practice makes perfect:

> "One can't believe impossible things."
> "I daresay you haven't had much practice," said the Queen. "When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast."

"Vitamin O" is still being sold. Testimonials abound. You can't argue with true believers. OXYGEN IS GOOD.

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# Digital Skepticism from Down Under

AMANDA CHESWORTH

*The Great Skeptic CD,* Australian Skeptics, Inc. $36.

It's fairly evident from visiting the online home of the Australian Skeptics (www.skeptics.com.au) that they're quite a clever bunch on the technological front, keeping pace with all the latest trends and developments. The Web site is a joy to navigate and the content is rich in educational value. Readers of their flagship journal *The Skeptic* are equally satisfied with the high quality of content provided in print format. Sadly, people up over may not be aware of the greatness to be found down under so here we are to tell you about it. . . .

The latest offering from the Australian Skeptics is a fabulous interactive compact disk which contains twenty years of content from *The Skeptic* magazine and additional treats for the inquiring mind. The CD is surprisingly easy to upload and is accessible to both PC and MacIntosh users. The content is global in its reach and applicability.

Upon placing the disk into your CD drive a user-friendly interface pops up onto the screen, asking you to choose one of three options: start, browse, or exit. By pressing start, you bring up the interactive content of the CD via Acrobat Reader and are provided with a navigation bar to jump between sections, peruse the index, get instructions, and more. Two of the leading men on the Australian skeptic scene, Barry Williams and Richard Saunders, introduce you to the organization and answer a few of the questions you may have about the resource you are about to dip into.

The Great Skeptic CD
20 years of the Skeptic,
a journal of fact and opinion from Australian Skeptics
the skeptic
1981 — 2000

The CD is fully searchable by word or phrase and you can read entire issues —from 1981 to 2000—via the Quick Index. It is an immense amount of content on a long and fascinating list of subjects—there is over 4,000 pages of amazing stuff!

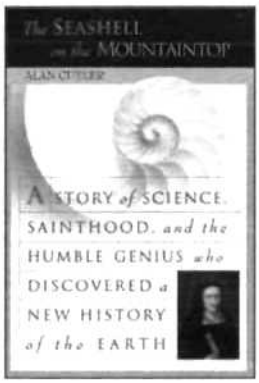
With each issue you have a detailed table of contents to the left of the screen allowing you to access whatever topic interests you most. Cover art and the photos and illustrations from the magazine are also included. Bits and pieces from television programs are reproduced with astonishing clarity. Even the crossword puzzles are there.

But that's not all. It also includes two excellent publications, *Creationism: An Australian Perspective* and a dictionary of skeptical topics entitled *Skeptical.* The only thing missing is Barry Williams on the merits of cricket.

This CD is truly a goldmine, a comprehensive reference tool for educators, students, researchers, and journalists, an extensive resource on all subject matter worthy of the skeptical eye, and a fabulously entertaining and enjoyable production to pass the time with. Just follow the yellow brick road!

Interested readers may purchase the CD through the Australian Skeptics: online via www.skeptics.com.au; by e-mail: contact@skeptics.com.au; or by mail at Australian Skeptics, PO Box 268, Roseville NSW 2069, Australia.

*Amanda Chesworth is educational director for CSICOP and directs the Inquiring Minds program at www.inquiringminds.org.*


The SEASHELL on the MOUNTAINTOP
ALAN CUTLER
A STORY of SCIENCE, SAINTHOOD, and the HUMBLE GENIUS who DISCOVERED a NEW HISTORY of the EARTH

# Earth, Life, and Religion: An Early Geologist's Odyssey

JAMES C. SULLIVAN

*The Seashell on the Mountaintop: A Story of Science, Sainthood, and the Humble Genius Who Discovered a New History of the Earth.* By Alan Cutler. Dutton, New York, 2003. ISBN 0525947086. 228 pp. Hardcover, $25.95.

A long title for a short book, it's the story of Nicolaus Steno. Born in 1638, a Danish Lutheran, as a young man Steno became an anatomist who, with an extremely delicate touch, dissected cadavers. He quickly gained fame around Europe for this science. Then he got interested in what, even at that time, had been an age-old question: why were what looked like seashells and other fossils being found on mountaintops?

Steno traveled widely looking for such fossils, and Italy became his country of choice for the search. Moving to Florence, he soon came under the patronage of the Medici family.

Over time, he did less anatomy and more of what would come to be called geology. Thanks, however, to the strictures imposed by the biblical scriptures, the consensus was that either those items resembling seashells and the like found in rocks and atop mountains had been placed there at Creation by the Almighty or grew underground spontaneously.

Steno didn't think either was the true case. After much study, he concluded that the seashells found on high were in fact the remains of the genuine article. The question was how they got in such a rocklike condition. He arrived at the idea that the creatures had, naturally, once lived in the sea. When the organisms died, they sank to the bottom and into the sediment. Over eons, more sediment piled on top. Then the sea dried up, and the former sea bottom became sedimentary rock. Inside it were the seashells. But they'd gone through a chemical process in which they became fossilized, or rock. Yet they had, for the most part, kept their shape.

The question remained, how did they get on the mountain? With the biblical story of Noah's Flood, many people interested in the same question thought that those flood waters had dispersed the fossils where they were currently being found. Not Steno. He thought that when the sedimentary rock was heaved up into the mountains by various geological forces, the fossils in them ended up where they were discovered.

He even wrote a short volume on his findings, *De solido* (*The solid* ). It was published in 1669. This was to be a prelude to a more thorough treatment of the subject in a much larger tome. To publish, Steno had to submit his work to the Church censor for approval. The author was cognizant of what had happened to Copernicus, and later to Galileo. But *De solido* met a better fate than those other scientists' books had. Two of Steno's best friends in the Church were selected to review the book, and they fully approved of it.

Soon Steno gained even more scientific stature with this fossil study. In his extensive travels, he met other scientists, many of them Roman Catholic. They impressed Steno with their zeal and piety. He also was astonished at the Roman Catholic rituals and religious fervor in Catholic Italy and began to study this faith. In the late 1660s, he converted, angering his Protestant contemporaries.

His home country, thoroughly Lutheran, didn't tolerate Catholics at all, and Steno's conversion posed a serious problem for the Danes. After all, Steno was their favorite son.

In 1675 Steno became a priest. As he had drifted away from anatomy when he began his study of fossils, he slowly abandoned his geology. He was made a bishop in 1677 and sent to Germany to minister to a small flock of Catholics.

The German Catholics rejected him, and he became a more inwardly religious person. And after neglecting his body and feeding his soul, he took ill and died at age 48. He was so poor at his death that he had no clothes in which to be dressed for his own funeral.

Steno qualified to be beatified, but he has yet to be canonized. In some circles, he is already considered saintly.

Scientists have looked in vain for Steno's further work on geology. Still *De solido* had made an impression in the scientific world. But over the centuries, Steno was forgotten, as was his contribution to geology. Perhaps this was the direct result of his leaving science for religion. This new book goes a long way toward reviving his reputation.

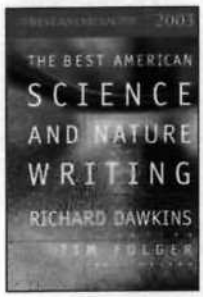
Connected with the Smithsonian Institution, author Alan Cutler is a Ph.D. geologist who has written for national periodicals.

Cutler writes: "But [Steno's] most revolutionary achievement came afterward and in a totally different [from anatomy] field of science, one that did not really even exist until he had published a slim volume—all of seventy-eight pages, with just a handful of simple diagrams—in which he laid down its blueprint for the science of the earth's geologic history, of deep time." □

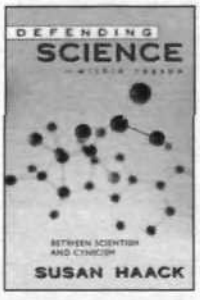
*Jim Sullivan writes from South Bend, Indiana.*

*Listing does not preclude future review.*

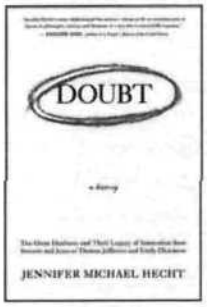
**The Best American Science and Nature Writing 2003. Edited and with an Introduction by Richard Dawkins.** Series Editor Tim Folger. Houghton Mifflin, Boston, 2003. 324 pp. $13, softcover. This eclectic selection of diverse science exposition includes Clark R. Chapman and Alan R. Harris's "A Skeptical Look at September 11th," from the September-/October 2002 *SKEPTICAL INQUIRER*, plus many other elegant articles by scientists and writers many readers will admire: Elizabeth Loftus on memory faults and fixes, Steven Pinker on the Blank Slate, E.O. Wilson on the conflict between short-term and long-term values about the environment, Steven Weinberg on the truth about missile defense, and Timothy Ferris on astronomy's new stars. As for the Chapman/Harris article, Dawkins in his introduction acknowledges that it has been controversial to some but says he finds their essay "a type specimen, an example of how the *scientific* way of thinking might influence our lives for the better," and he concludes with a final reference to Carl Sagan's candle "and science's power to banish our fears of the dark."




**Defending Science—Within Reason: Between Scientism and Cynicism. Susan Haack.** Prometheus Books, Amherst, NY, 2003. 411 pp. $28, hardcover. A prominent philosopher articulates a new and, she says, hopefully true understanding of what science is and does. She calls it a constructive project. She defends the pretensions of science to tell us how *the world is, but in* only a quite modest, qualified way. She advocates "critical common-sensism," a viewpoint she hopes can correct the over-optimism of the "old deferentialism" toward science and the "factitious despair" of the "new cynicism" of its harshest critics. Fallible and flawed as they may be, she argues that the natural sciences have been among the most successful of human enterprises. She explores the complexities of scientific evidence and the many ways scientists have developed to tease out evidence and meaning from nature. Along the way she addresses such topics as science vs. literature and science and religion, tries to provide a sensible program in the sociology of science, and examines the claim that there is an end to science. (We expect to publish excerpts from this book in coming issues of SI.)




**Doubt: A History. Jennifer Michael Hecht.** HarperSanFrancisco, 353 Sacramento St., Suite 500, San Francisco, CA 94111, 2003. 576 pp. $27.95, hardcover. A sweeping history celebrating doubt as an engine of creativity and as an alternative to the political and intellectual dangers of certainty. It's a study of religious doubt all over the world, from the beginning of recorded history to the present day. Hecht, an historian and poet, provides in part an intellectual history and in part a showcase of people who became the heroes of doubt—Confucius, Socrates, Jesus, Hypatia, Galileo, Thomas Jefferson, Darwin, Marie Curie, Emily Dickinson, Margaret Sanger, and many others. Hecht says there have been many histories of belief but doubt has been given far less attention—thus her attempt to present a strong, cohesive history. She considers doubt not just a denial of God and the afterlife but a series of attempts to make sense of life, the natural world, and the self, on their own terms.



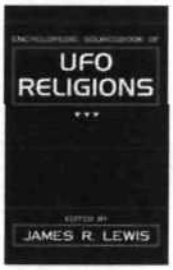

**Mortal Evidence: The Forensics Behind Nine Shocking Cases. Cyril Wecht, M.D., J.D., and Greg Saitz with Mark Curriden.** Foreword by Henry Lee. Prometheus Books, Amherst, NY 2003. 320 pp. $26, hardcover. The science of forensic pathology is brought to vivid life in this series of nine first-person, behind-the-scenes looks at nine famous cases. They include the Sam Sheppard, O.J. Simpson, and JonBenet Ramsey cases. Wecht has conducted more than 14,000 autopsies and signed off on or supervised an additional 35,000. He points out that the power of forensic science can solve cases that otherwise would defy a solution or explanation. And he finds that things are not always as they seem.

**Psi Wars: Getting to Grips with the Paranormal. Edited by James Alcock, Jean Burns, and Anthony Freeman.** Imprint Academic, P.O. Box 7147, Charlottesville, VA 22906-7147. 2003. 250 pp. $24.95, softcover. This is a collection of articles originally published as a special issue of the respected *Journal of Consciousness Studies.* It is an attempt to attain informed, balanced dialogue about the many controversies in the field, in this case concerning parapsychology. The editors struggled with how to deal with the parapsychology papers, which arise outside mainstream science. The decision was made to allow the parapsychologists to express the "standard view" of parapsychology. This would expose readers equally to parapsychologists' and skeptics' views of the field, letting them judge the merits of each side. After introductory chapters, including Alcock's "Reasons to Remain Doubtful About the Existence of Psi," chapters fall into three sections: Experiments Concerning Psi, Views About Anecdotal Accounts of Psi, and Theoretical Perspectives. (Among them is Dean and Kelly's "Is Astrology Relevant to Consciousness and Psi?"—which aroused astrologers' ire in a controversy recounted in this issue [News & Comment, p. 8]).

**Media Mythmakers: How Journalists, Activists, and Advertisers Mislead Us.** Benjamin Radford. Prometheus Books, Amherst, NY, 2003. 324 pp., $25, hardcover. Radford (SKEPTICAL INQUIRER'S managing editor and co-author of *Hoaxes, Myths, and Manias*) discusses how the media help shape our concerns and priorities—and how easily those concerns and priorities can be manipulated for personal gains and political agendas.

Part 1 discusses advertising and the illusion of meaning. In Part 2 Radford examines the biases and manipulations of the news media. He points out that the news media usually try to make sure their reporting is not obviously politically biased, but other, less obvious biases that plague the business, ranging from choices on who to interview and what to report, often result in emphasizing bad news and minor fears and risks. Part 3 discusses how politicians and the media exploit emotions and tragedies. Part 4 discusses the damage caused by the media's myths (medical scares surrounding breast implants, birth control, and autism, for example, or false accusations of satanic ritual child abuse). In the last section he suggests some positive recent trends toward more responsible journalism, how the news media can do better, and how to overcome emotional manipulation.

**The Encyclopedic Sourcebook of UFO Religions. Edited by James R. Lewis.** Prometheus Books, Amherst, NY, 2003. 550 pp. $99, hardcover. A compilation of the best new scholarship on the expanding field of study of UFO religions. The majority of contributors are senior scholars who have been researching and reflecting on the phenomena of UFO religions for years. Part 1 deals with contactee religions in general. Parts 2, 3, and 4




examine all of the more prominent UFO religions, by era of origination: The Aetherius Society and Uranius Society (1950s), Heaven's Gate and the Raelian movement (1970s), and Chen Tao and the Ground Crew (1990s). The chapters in Part 5 measure UFO beliefs and discuss the future of UFOs and religion. The authors' reflections offer insights into why UFO religions are here to stay, how to understand them, and how to prevent future tragedies like Heaven's Gate.

*—Kendrick Frazier*

# SCIENCE BEST SELLERS

## Top Ten Best Sellers

**1** ***Small Things Considered: Why There Is No Perfect Design***
Henry Petroski

**2** ***The X in Sex: How the X Chromosome Controls Our Lives***
David Bainbridge

**3** ***Prehistoric Art: The Symbolic Journey of Humankind***
Randall White

**4** ***Imagining Numbers (Particularly the Square Root of Minus Fifteen)***
Barry Mazur

**5** ***Nature Via Nurture: Genes, Experience, and What Makes Us Human***
Matt Ridley

**6** ***The Bipolar Child: The Definitive and Reassuring Guide to Childhood's Most Misunderstood Disorder***
Demitri F. Papolos and Janice Papolos

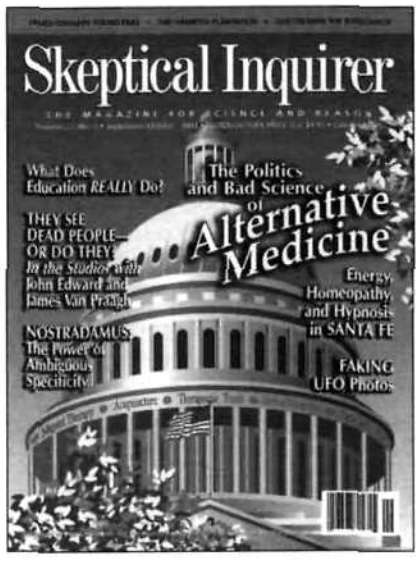
**7** ***The Golden Ratio: The Story of Phi, the World's Most Astonishing Number***
Mario Livio

**8** ***Looking for Spinoza: Joy, Sorrow, and the Feeling Brain***
Antonio Damasio

**9** ***Prime Obsession: Bernhard Riemann and the Greatest Unsolved Problem in Mathematics***
John Derbyshire

**10** ***The Music of Primes: Searching to Solve the Greatest Mystery in Mathematics***
Marcus Du Sautoy

By arrangement with *Scientific American* (www.sciam.com), October 2003.


Skeptical Inquirer
What Does Education REALLY Do?
The Politics and Bad Science of Alternative Medicine
THEY SEE DEAD PEOPLE— OR DO THEY?
In the Studios with John Edward and James Van Praagh
Energy, Homeopathy, and Hypnosis in SANTA FE
NOSTRADAMUS: The Power of Ambiguous Specificity
FAKING UFO Photos

## The Politics (and Bad Science) of Alternative Medicine: Reaction

I read with interest the article by Kimball Atwood about the "Ongoing Problem with the National Center for Complementary and Alternative Medicine" (September/October 2003). Naturally I have long been a supporter of CSICOP and its efforts to expose fraud. And I have no reason to doubt what Atwood says in his article. However, I would like to caution that we as skeptics should not throw the baby out with the bath water. Just because the NCCAM has funded bad science doesn't mean that research into alternative medicine should cease, or that some alternative medicine might not have valid claims. Many practices now accepted were once thought crazy by the medical mainstream.

The NCCAM could be very useful, and might work with the aims of CSICOP instead of against them. Perhaps a cooperative, instead of an adversarial, relationship could be developed, and the skeptics of the world could then guide the NCCAM. One complaint CSICOP has made about alternative medicine is that its practices are not based on real, carefully constructed, double-blind research. This is not just because practitioners are bad scientists, but also because there is little profit in researching things like vitamins and nutrition. But quality research should be done, and NCCAM certainly has the money to do the research. It would be more in the interest of us all if CSICOP and NCCAM could work together to sift the good science from the pseudoscience.

Also, I would like to see mainstream medicine given equal investigative time. We know the following about the medical industry:

- it is not only a scientific body, but a set of social institutions, which are definitely *not* objective, but have their own agenda;
- that agenda contains a systemic conflict of interests that works against patients;
- that agenda has nothing to do with keeping people healthy, but with treating symptoms after disease has appeared. Healthy people do not consume medical services.
- it spends billions on advertising, with the result that most doctors get most of their information about drugs from drug salesmen; researchers have been known to cook research results, and the FDA (for example) does not do its own research but accepts the research of the people who have a vested interest in favorable results; drug reactions kill an enormous number of people each year.

If we don't accept the assumptions of fringe medicine on faith, we shouldn't accept the mainstream assumptions either. Mainstream medicine is much more powerful and has the potential to damage people much more than all the herbalists combined, and therefore it should be an important target for our investigations. Any investigation of the politics and economics of alternative medicine cries out for a similar analysis of mainstream medicine, and I hope that SKEPTICAL INQUIRER will tackle that soon.

Keep up the good work.

Myra Jones
Bradenton, Florida

Thanks to Dr. Kimball Atwood for keeping the heat turned up on the profit-driven mavens of so-called "alternative" medicine.

In his "dishonor roll" of irresponsible elected officials (Sen. Tom Harkin, Rep. Dan Burton) who lobby for bogus products and enterprises, Dr. Atwood should have included Senator Orrin Hatch, thanks to whose largesse the purveyors of junk "medicine" have for years enjoyed a unique ability to market their products virtually free from government oversight.

It's unfortunate that very few members of the drug-buying public understand the difference between anecdotal evidence and scientific (double-blind) testing, and why the latter is the only acceptable proof that a product will do what its manufacturers claim. My hometown newspaper, the *Los Angeles Times*, uses a reasonable approach in this area: while the paper's medical reporters do not take a stand per se against "alternative" medicine, they are always careful to point out whether or not a given remedy has been tested according to accepted medical protocol. This policy should be a requirement of all media.

Bonnie Sloane
Los Angeles, California

In the spring of 1954 I met Dr. Gerson and his wife and daughter. Besides the coffee enemas he also gave large doses of calcium. His charges had to be high because the stench of the feces was so bad the toilet area had to be extensively redone. He showed me a blank page in a medical journal that was to have his article but was stricken at the last minute because a cure would hurt the income of doctors. He also showed me x-ray evidence of a cure and offered information that he almost saved Ring Lardner's son from cancer but the establishment took him away before he could cure him. He died soon after.

A short time later I visited my uncle, a GP who explained to me the concept of critical thinking. Dr. Gerson may have thought he was not a fraud, but his therapy was fraudulent. Physicians really do want a cure for cancer. And blank pages are common in books and journals.

Four years later (before graduation from medical school) I wrote a library research paper on EDTA. The final impression was that chelating did lower blood cholesterol in familial hypercholestremia but did not prevent arteriosclerosis. I did not save this paper because I thought all the evidence against would have thrown it in the garbage pit by now. I guess I didn't realize the power of the screwball.

Leon Forman, M.D.
Huntington Beach, California

*Kimball Atwood replies:*

The letter from Ms. Jones is instructive because it demonstrates several misrepresentations and fallacies common to apologies for "complementary and alternative medicine" (CAM). Space precludes answering them in detail, but I will address a few.

*. . . that doesn't mean that research into alternative medicine should cease, or that some alternative medicine might not have valid claims.*

I did not write that all research into alternative medicine should cease (see below). Nevertheless, the chance that there are valid claims, other than for the ingestion of biologically active substances, is vanishingly low. Some practices that are touted by CAM proponents are not CAM at all: among these are diet and exercise, the benefits of which are either unremarkable (looking fit and feeling

good) or have been established entirely by scientific medicine and public health (reducing the risk of coronary artery disease). Other non-CAM practices include massage and other physical manipulations for musculoskeletal aches and pains, and "mind-body" techniques such as music therapy, relaxation, meditation, and guided imagery for anxiety. Some of these practices cross the line into CAM when they are accompanied by implausible claims for removing "toxins," prolonging life in patients with cancer, diagnosing diseases, preventing diseases, or treating organic diseases such as asthma or ulcerative colitis. CAM enthusiasts have blurred the distinctions between the legitimate and illegitimate advocacy of such methods by using the former as camouflage for the latter and by the use of such ambiguous terms as "healing" and "wellness," which mean different things to different people. In so doing they have managed to establish, at least in the minds of some people, an undeserved reputation for the validity of some CAM claims.

*Many practices now accepted were once thought crazy by the medical mainstream.*

For example, which practices? Initial skepticism of any new claim is an appropriate part of the scientific approach, as SI readers know. Other than that, I challenge Ms. Jones to name a single example, since the era of scientific medicine began in the second half of the nineteenth century, of a correct claim that faced dogmatic, closed-minded rejection by the "medical mainstream" for any significant amount of time. Even if there were such an example it would have no bearing on the plausibility of CAM claims, which can only be judged according to what is known about nature.

*One complaint CSICOP has made about alternative medicine is that its practices are not based on real, carefully constructed double blind research.*

True enough, and in my article I offered the NCCAM's Glucosamine/Chondroitin Arthritis Intervention Trial as an example of research that promises to be useful. The problem occurs with trials of highly implausible or impossible claims. Double-blind trials are very good at testing the validity of scientifically plausible hypotheses, but are not so good for implausible ones. This is because even well-designed trials remain vulnerable to error: several forms of bias, "data-dredging," fraud, statistical misinterpretations, and more. Thus, as has been amply demonstrated in the field of parapsychology, trials of incorrect, implausible hypotheses tend to yield inconsistent and equivocal results rather than merely negative ones. Proponents and many "neutrals" view equivocal results as implying validity or, at the least, the need for more research. In fact, since such results are entirely expected for trials of highly implausible claims, they constitute evidence for the null hypothesis ("extraordinary claims require extraordinary evidence," remember?). Those who don't agree with this might ask themselves when, if ever, such research is no longer justified. As has been argued previously in SI, a Bayesian statistical approach makes this case in a more formal manner (Pigliucci, Massimo. 2002. Hypothesis Testing and the Nature of Skeptical Investigations. SKEPTICAL INQUIRER 26(6)27–30, 48).

*Also, I would like to see mainstream medicine given equal investigative time [etc.].*

A. Pointing to the failings of "mainstream medicine" is irrelevant to criticisms of CAM. It is an example of the logical fallacy known as *tu quoque* ("you too").

B. There is not a "medical industry" per se, but a diverse group of entities: doctors, nurses, allied health professionals, medical scientists, hospitals, health insurers, pharmaceutical companies, medical equipment suppliers, medical schools, organized medicine, government agencies, and more. These may or may not cooperate well with one another or do exactly what any one person thinks is best for all people at all times. But there is no monolithic industry.

C. That modern medicine's "agenda has nothing to do with keeping people healthy, but with treating symptoms after disease has appeared" is contrary to fact. All of preventive medicine, from clean water and vaccinations to effective contraceptives to prenatal care to stopping smoking to diet and exercise to treating high blood pressure and high cholesterol to pap smears, mammograms, bone mineral analyses, stool testing for occult blood, "safe sex," HIV testing and all the rest, came from the investigative efforts of scientific medicine and public health. CAM proponents may claim to be "holistic" and favor maintaining health over treating disease, but these are nothing more than empty advertising slogans. Holism requires knowledge of human biology. There is not a single CAM practice that has the slightest biological basis for "keeping people healthy," although many have been proposed: "spinal adjustments," "detoxification," enemas, "balancing Qi," "unruffling energy fields," "craniosacral therapy," "constitutional" homeopathic preparations, etc.

D. Most doctors do not "get their information about drugs from drug salesmen." Where did Ms. Jones get that idea? The reality is that virtually all doctors recognize drug salesmen for exactly what they are: salesmen. Most doctors get their information about drugs from medical schools, post-graduate training programs, medical conferences, textbooks, and medical journals.

E. That there are inherent risks to complex interventions in sick people is unsurprising, but these risks are justified as long as they are outweighed by benefits. Harm caused by medical procedures or pharmaceuticals is widely known to Ms. Jones and the rest of the public only because modern medicine investigates its own practices and publishes its findings. It is now in the very active process of designing measures to increase safety, much as the airlines and other inherently high-risk but highly reliable enterprises have done. All of this stands in sharp contrast to the risk of catastrophic stroke from a chiropractic cervical spine "adjustment," for example, where there is no biological basis for performing the procedure in the first place. Chiropractors, meanwhile, have bristled at even the suggestion that the procedure might be dangerous.

F. Bad research is a fact of the scientific world, but is irrelevant to the case against CAM (*tu quoque* again). It is also generally not grist for the SI mill (although sometimes it is), both because it is addressed in other venues and because it is not pseudoscience per se.

*Perhaps a cooperative, instead of an adversarial, relationship could be developed, and the skeptics of the world could then guide the NCCAM.*

I couldn't agree more. Perhaps Ms. Jones could convince Sens. Harkin and Hatch, Rep. Burton, and colleagues of the value of this plan. In all seriousness, I commend to readers this link to CSICOP Online, in which the issue of a cooperative versus adversarial relationship is debated by others knowledgeable in the subject: www.csicop.org/doubtandabout/cam/. It will be clear where my opinion rests.

## Alt-Med in Australia

Barry Williams wrote a piece about the Pan Pharmaceuticals furore in the September/October 2003 of SKEPTICAL INQUIRER (News & Comment section). In it he expressed the hope that the Australian public would come to its senses and leave alternative medicine behind.

I think he was being too optimistic. The vacuum created by the collapse of Pan

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appears to be being quickly filled by other companies, in particular Blackmores Ltd. Just prior to the Pan collapse, Blackmores was trading at about $5.50 (Australian) a share. Profits were flat and the market was giving it the thumbs down. What a difference a week makes. Now they are trading at $7.80, profits are up, sales are up, dividends are up, and the future looks rosy.

I thought it would be a good idea to make a small investment in Blackmores, so I did.

Ken Walker
Roleystone WA, Australia

## What's Cause, Effect?

The article by Losh, et al. ("What Does Education Really Do?" (SKEPTICAL INQUIRER September/October 2003) presented some interesting statistics regarding education and pseudoscientific beliefs, but it didn't answer the fundamental question of cause and effect.

Does education teach people to think better and so discriminate against nonsense, or are there two types of brains—those inclined to think rationally and value learning and education, and those inclined to think irrationally and to discount the value of education? The correlations don't tell us which is true. I suspect it will turn out to be some of both, with the emphasis on the latter.

Frank D. Kirschner
Alexandria, Virginia

## Gibberish Prophecies

I enjoyed Yafeh and Heath's article on "Nostradamus's Clever Clairvoyance" (September/October 2003), in which Nostradamus's quatrains are presented as ink blots—not really foretelling anything but permitting people to fit future history to rather nebulous poems.

The article's authors and readers may enjoy referring to my May 2001 SI article "The Antinoüs Prophecies: A Nostradamoid Project" in which I mentioned my study of people ascribing meaning to scrambled Nostradamus quatrains. My article, as well as my book *Dreaming the Future* (Prometheus), also emphasized the detailed historical meanings people ascribed to Nostradamus-like prophecies, which I randomly generated. In particular, I composed quatrains of gibberish just by letting my mind wander and writing the first images that came to my mind. As far as I was concerned, they had no particular meaning or significance.

After composing the quatrains, I asked people to match my quatrains with actual historical happenings. I called the quatrains the "quatrains of Antinoüs," which sounded suitably exotic. Amazingly, respondents found that my Antinoüs "predicted" such events as: the 1989 Loma Prieta earthquake, the comet that wiped out the dinosaurs, the rise of Microsoft, the wreck of the *Titanic*, the American War of Independence, the Punic War, the Jewish holocaust, the importance of Henry Ford, the Second Crusade, and much more. The famous Prophecies of Antinoüs are printed in entirety in my article and book.

Cliff Pickover
Yortkown Heights, New York

As a linguistics student, I read Nostradamus in the original (as much as I could stand) and I would suggest that the ambiguity of his predictions comes from his frankly poor grammar, particularly his scanty knowledge of Latin grammar. This grammatical imprecision, as you might guess, leaves the interpreter great leeway, because much of it is absolutely nonsensical without some interpreter-biased . . . interpretations. As a parallel, plug Gus's mangled Latin motto from "Lonesome Dove" ("*uva uvam vivendo varia fit*") into any Internet search engine and get a laugh out the wide variety of interpretations of that ungrammatical motto. Hmmm, perhaps I can make that into a prediction of September 11. . . .

Also, Joe Nickell's article on the Myrtles ("Haunted Plantation") gives me once again an opportunity to trot out my story on How I Became a Ghost on My Honeymoon. In 1995, my husband and I spent our honeymoon touring plantations in Louisiana, ending up at The Myrtles bed and breakfast in St. Francisville. We were to share the big old house with a pair of sisters who were staying in the other half. We settled into the Haunted Honeymoon suite, and I left my husband reading on the Haunted Chaise Longue while I explored the house. I have to admit, the house is creepy, or should I say creaky. Believing myself to be alone, I freely wandered around all the bedrooms upstairs, until I poked my head into a bathroom and saw one of the sisters putting on makeup in front of a mirror. Our eyes met in the mirror, and, embarrassed at being caught snooping, I quickly retreated to our suite.

The next morning at breakfast in the adjoining restaurant, the woman was breathlessly telling her server and other breakfast guests about seeing a ghost in the mirror the previous day! I have no doubt that by now The Myrtles' ghost stories include one of a young woman dressed in a white wedding gown who appears only in the mirror in the west bedroom. . . . But disappointingly (to me, anyway) the only fright I had during our visit was in the honeymoon suite bathroom: No shower, only a bathtub.

By the way, a few years after our visit I found a book from the 1930s or 1940s about haunted plantations and the ghosts listed at Myrtles were a completely different set than the ones we were told about!

I enjoy your magazine and only wish it came monthly!

Jennifer Sherwood
Olathe, Kansas

## This UFO Was Real

As I read Tom Callen's account of his labors in making photos of fake UFOs look as real as possible (September/October), I was reminded of my much simpler encounter with a real UFO. I did not have a camera, but it occurred in the late 1940s, when I was a teenager, in Newton Highlands, Massachusetts. I was sitting with a girl on a park bench overlooking Crystal Lake. I do not recall who the girl was, but it was not my wife, whom I did not meet until years later. However, I recall the incident clearly. It was a dark, overcast evening, but still, the reflection in the water of the streetlights from across the lake made it a romantic scene. We became aware of a saucer-sized, hazy disc glowing in the sky in front of us. We became a bit apprehensive when it appeared to be coming straight toward us as it grew brighter and brighter. Suddenly it broke through the overcast and changed before our eyes into an extraterrestrial IFO (Identified Flying Object)—the Moon!

David W. Briggs
Augusta, Maine

## Tortured Expression in Poll

The findings of the Harris Poll (News & Comment, September/October 2003) were interesting, but not as interesting as the tortured manner of their expression. We were continually seduced with "only" whenever the article [text of the Harris Poll news release] referred to such alarming facts as 85% of postgraduates believing in God. I

was frankly astounded that the majority of postgraduates believed in miracles (72%); heaven (71%); survival of the soul (78%). If this was some kind of advert for the U.S. education system, it was not particularly convincing. It makes one wonder what people are taught in graduate school.

John Keane
Appleton
Cheshire, England

## Myths About Psychology

Greg Martinez's review of the biography of Harry Harlow (September/October) certainly demonstrates that he was a fascinating character. However, in trying to "place" Harlow's work historically, Martinez perpetuates two myths about twentieth century psychology. Behaviorists like B.F. Skinner never dominated the field as is claimed. In the 1950s, when Skinner and Harlow were both coming to prominence, many approaches existed side by side.

Similarly, Harlow's work did not eventually discredit behaviorism. Behaviorism is alive and well. There is a particular irony in the fact that the review by Martinez is followed by a review by Peter Lamal, an eminent behaviorist!

Sandy Hobbs
School of Social Sciences
University of Paisley
Paisley, Scotland

## Looking at the Rorschach

Our article "The Rorschach Inkblot Test, Fortune Tellers, and Cold Reading" (July/August 2003) addressed a baffling puzzle concerning the famous Rorschach Inkblot Test. Why have so-called Rorschach Wizards often been able to make seemingly impressive readings in case conferences, but then performed poorly in research studies? As we explained, the Wizards have apparently been unwitting practitioners of "cold reading," a technique used by astrologers and palm readers to convey a false impression of uncanny insight.

In letters to the editor of SI (November/December 2003), readers made interesting observations, raised important issues, and even related entertaining anecdotes. For example, we learned that we are not the first individuals to note the striking resemblance of the Rorschach to a fortune-telling technique. We are happy to give credit to Dr. Ulett for his prior insights.

Doctors Laux and Shimabukuro contend that, whatever the problems of the Rorschach in the past, we now possess a scientifically sound approach to the test: John Exner's Comprehensive System. We disagree strongly with Laux and Shimabukoro. Our article was excerpted from our book *What's Wrong with the Rorschach?*, which discusses Exner's Comprehensive System in considerable depth. As the book explains, very few scores in Exner's System are valid for their intended purpose. Furthermore, research has shown that relatively normal people tend to look psychologically "sick" when they are tested using this Rorschach System.

Gjelfriend and Reber claim that the Rorschach can be useful in psychotherapy. According to Gjelfriend, "The Rorschach test may be successful regardless of objective truth. We all know that a client's faith in his/her therapist is a powerful force." Reber argued that a psychotherapist can present test results to a client and ask whether any of the interpretations seem to be true, thus providing "an opportunity for an extended, unbounded interaction between client and therapist. . . ." We find these ideas interesting, but they are based on speculation and testimonials, with no research to support them. Besides, if one wants to enhance "a client's faith in his/her therapist" and promote "extended, unbounded interaction" during psychotherapy, then why not use tests that have strong empirical support and are relatively inexpensive?

Finally, letters by Held, Hruska, and Tripician all related humorous anecdotes. Attempts to leaven what has been a long and contentious controversy are appreciated. By the way, did you hear about the middle-aged client who saw food and a mirror in an inkblot? He explained that he was at the age where food had taken the place of sex in his life. In fact, he had just had a mirror put over his kitchen table.

Howard Garb
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Associate Professor, Emory University
Atlanta, Georgia

*The views expressed in this letter are those of the authors and are not the official policy of the Department of Defense or the United States Air Force.*

## Philosophy and Limitations of Knowledge

Ralph Estling's reply to Pantazis Mouroulis's and Robert P. Crease's letters (July/August 2003) was overly dismissive of philosophy (as was Estling's original article "The Inconsolations of Philosophy" March/April 2003).

I agree with Estling that there is a great deal of absurdity in continental philosophy, but analytic philosophy still retains its rigorous logical standards and remains a valid form of inquiry. Philosophy has always been useful in pointing out the limitations of knowledge. Consider one of philosophy's central problems: Cartesian skepticism or external world skepticism.

Philosopher René Descartes gave global skepticism its classic formulation, but contemporary philosopher Hilary Putnam's brain-in-a-vat scenario (which is an updated version of Descartes's argument) is also illuminating. Putnam's scenario asks us to consider the possibility that one might be a disembodied brain kept alive in a vat of nutrients while being hooked up to a computer which is stimulating one's brain, thereby producing all the experiences that would usually be produced by an external world. Given this possibility, how can one know that it isn't true, and therefore how can one have justified knowledge of the "real" world?

Any argument one might use to refute external world skepticism fails. For example, the reference to science's successful predictions to justify our accurate knowledge of the external world would be futile, for those predictions and their realizations could be referring to, and generated by, a virtual world fostered on us by a computer-stimulated envatted brain.

As I'm sure some have noted, any further arguments one might use to refute Cartesian skepticism (e.g., Occam's Razor or probabilistic arguments) are equally ineffective, since all these concepts and methodologies could have originally been planted into one's envatted brain. All of our beliefs could be put into doubt including logic and even mathematics itself (as alluded to by

Descartes). Of course, one can always choose not to believe in this skeptical scenario, but that choice would be just that—a choice. No logical reasoning or empirical evidence can justify it. Many philosophers have since attempted their own refutations of Cartesian skepticism (including Descartes and Putnam himself). Some of these arguments have indeed been convincing; others have not.

Cartesian skepticism serves as a reminder that, given science's advances, uncertainty in human knowledge will always remain, for there will always be an epistemic gap between what we perceive with our senses (as interpreted by our brain) and the "real" world which those perceptions are supposed to represent (a distinction alluded to by philosopher Immanuel Kant and others). I fail to see how science can provide the solution to this particular philosophical problem, since the activity of science itself already presupposes the problem's solution. I doubt that this is just another frivolous philosophical problem.

The apparent insolubility of philosophical problems, or their perceived lack of any worthwhile or practical utility, should not preclude all interest in them. The prime reason that philosophical problems continue to be bounced around between philosophers is for the very same reason that subatomic particles continue to be bounced around in particle accelerators; it is to satisfy human curiosity. It is this curiosity that first motivated the development of science and philosophy. I think that any practical human benefit derived from either has always been a secondary motivation.

Rui Vieira
Mississauga, Ontario
Canada

## Risk Statement Bewilders

I am bewildered and disturbed by the second paragraph of Chapman and Harris's response to Pinker in the July/August 2003 SKEPTICAL INQUIRER. Are they really suggesting that the number of people who feel threatened by terrorism should be equal to the number of people who will actually be harmed by it?

Is it also true that of all the smokers who read the warnings that they are at risk of cancer, only a proportion equal to the number that will actually get cancer should believe themselves at risk? Most of them won't get cancer, but they are all at risk, and they should all realize this.

It may well be that about a quarter of Americans live or work in cities, or live or work in or near other potential specific targets for terrorists, either foreign or domestic. It is perfectly reasonable for those people to suppose they are at some risk, though not at high risk.

Barrie Tite
Harlow, Essex
United Kingdom

## Menstruation Mistakes

I am glad that author Stephen Flora (Letters, September/October 2003) acknowledged his and Sellers's mistake in using *The Red Tent* as an ethnographic source. Otherwise, I fear he only compounded the problem.

1. In his claim that most cultures have "celebrated" menstruation, he uses the Web site of the Museum of Menstruation and Women's Health as a source. Unfortunately, the "facts" on their Web site are a random collection gathered from sources of highly variable quality, and have no particular authority in themselves.

2. From this source he asserts that "menstruation was celebrated by females of the ancient Celtic Druid religions." The Druids *were* Celtic, although not all Celts were Druids, and at any rate what is the authority for this claim? Our knowledge of ancient Celtic cultures comes only from archaeology, the ethnographic writings of Greek and Roman authors, and medieval Christian redactions of pre-Christian Celtic narratives. Where does this information on menstruation come from?

3. He adds that menstruation is also celebrated "to this day by Wiccans," which implies long and continuous custom. However, Wiccan practice is almost entirely late twentieth century in invention, and heavily influenced by "mystical crap" written "about the supposed worldwide ancient female culture" that your readers so rightly ridiculed as a source for ethnographic claims.

4. He then provides a quote from one writer (whom he does not cite), about what happens in "many traditions," which are not identified. I wouldn't even let an undergraduate get by with that in a term paper.

I also don't care for his repetition of the traditional medical argument that women's menstrual symptoms are all in our heads. But what concerns me most is Flora replacing one bad source with multiple bad sources and fuzzy statements.

Victoria Simmons
Program in Folklore and Mythology, UCLA
Los Angeles, California

## Sarfatti Replies

I find Sheaffer's too vague remark that I have "promoted" "similar stories" in his all-too-brief rebuttal to my letter (September/October 2003) very strange.

What precisely is he alluding to? Again I state for the record that I have never promoted any phony stories about exotic UFO WMD "reverse engineering" by Saddam Hussein's evil regime. To allege that is damaging and completely false.

Jack Sarfatti
San Francisco, California

*Robert Sheaffer replies:*

*My brief rebuttal in the September/October issue does not even mention Iraq, or imply anything about it. I said only that Sarfatti had promoted "similar accounts." To answer his request for me to be specific: in one example, on Sarfatti's own Web site (www.qedcorp.com/Q/Qship.html) we find the statement: "What I want to emphasize is, unlike anything else in the UFO literature that I have read, Colonel Philip Corso's qualitative descriptions of how the ET flying machine is powered and navigated is right on the money! Quote me!" Corso's book refers, of course, to allegedly reverse-engineered technology taken from a crashed UFO. While this is less than a full-fledged endorsement of Corso's claims by the cagey Sarfatti, it certainly leans in that direction.*

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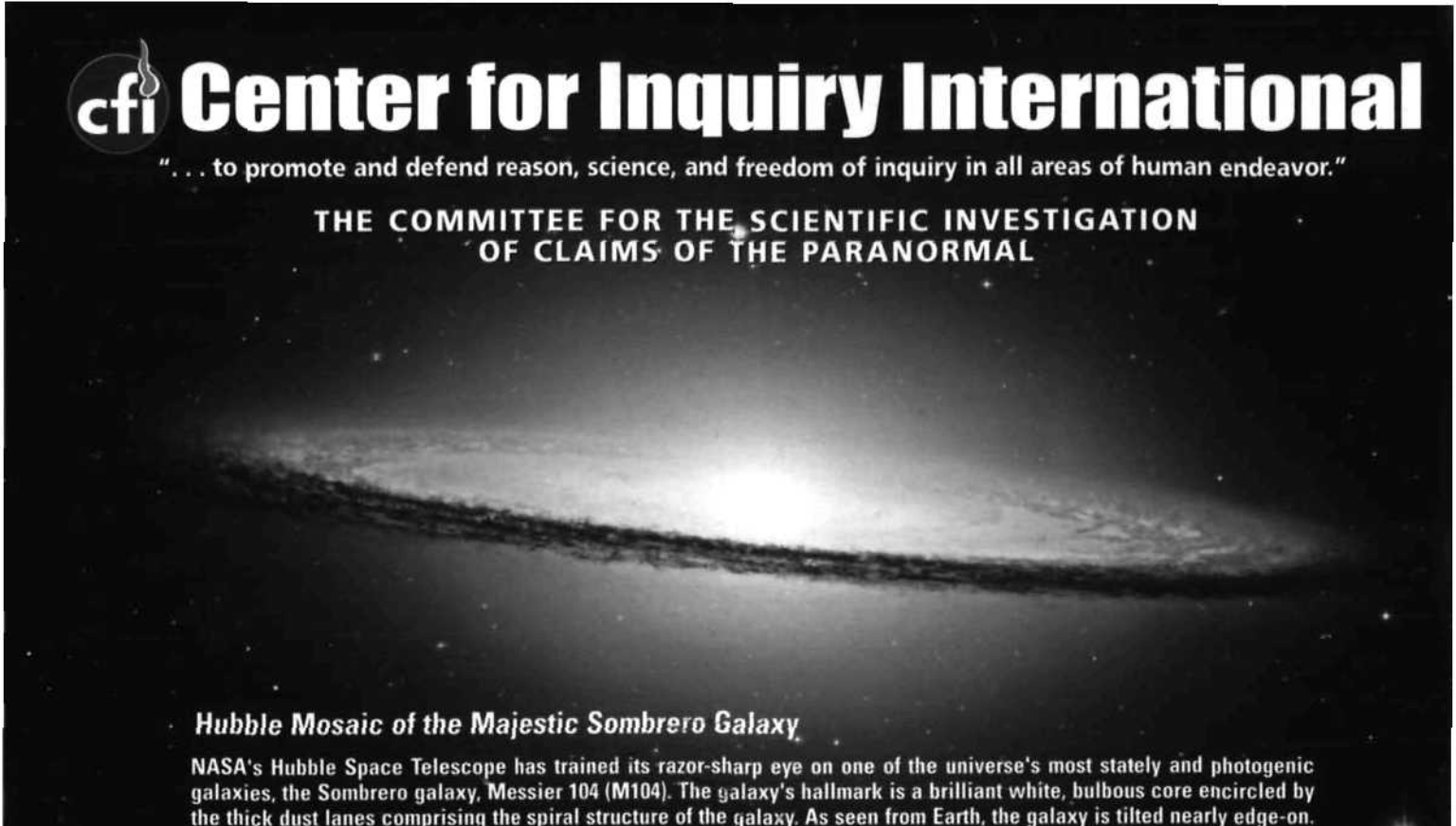
# Center for Inquiry International

"... to promote and defend reason, science, and freedom of inquiry in all areas of human endeavor."

## THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL



***Hubble Mosaic of the Majestic Sombrero Galaxy***

**NASA's Hubble Space Telescope has trained its razor-sharp eye on one of the universe's most stately and photogenic galaxies, the Sombrero galaxy, Messier 104 (M104). The galaxy's hallmark is a brilliant white, bulbous core encircled by the thick dust lanes comprising the spiral structure of the galaxy. As seen from Earth, the galaxy is tilted nearly edge-on. We view it from just six degrees north of its equatorial plane. This brilliant galaxy was named the Sombrero because of its resemblance to the broad-rimmed and high-topped Mexican hat.**

**Credit: NASA and The Hubble Heritage Team (STScI/AURA)**

# Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

**The Committee is a nonprofit scientific and educational organization.**
**The SKEPTICAL INQUIRER is its official journal.**

The Committee for the Scientific Investigation of Claims of the Paranormal encourages the critical investigation of paranormal and fringe-science claims from a responsible, scientific point of view and disseminates factual information about the results of such inquiries to the scientific community, the media, and the public. It also promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues.

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